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APRIL 11, 1936

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ELECTRICAL WORLD

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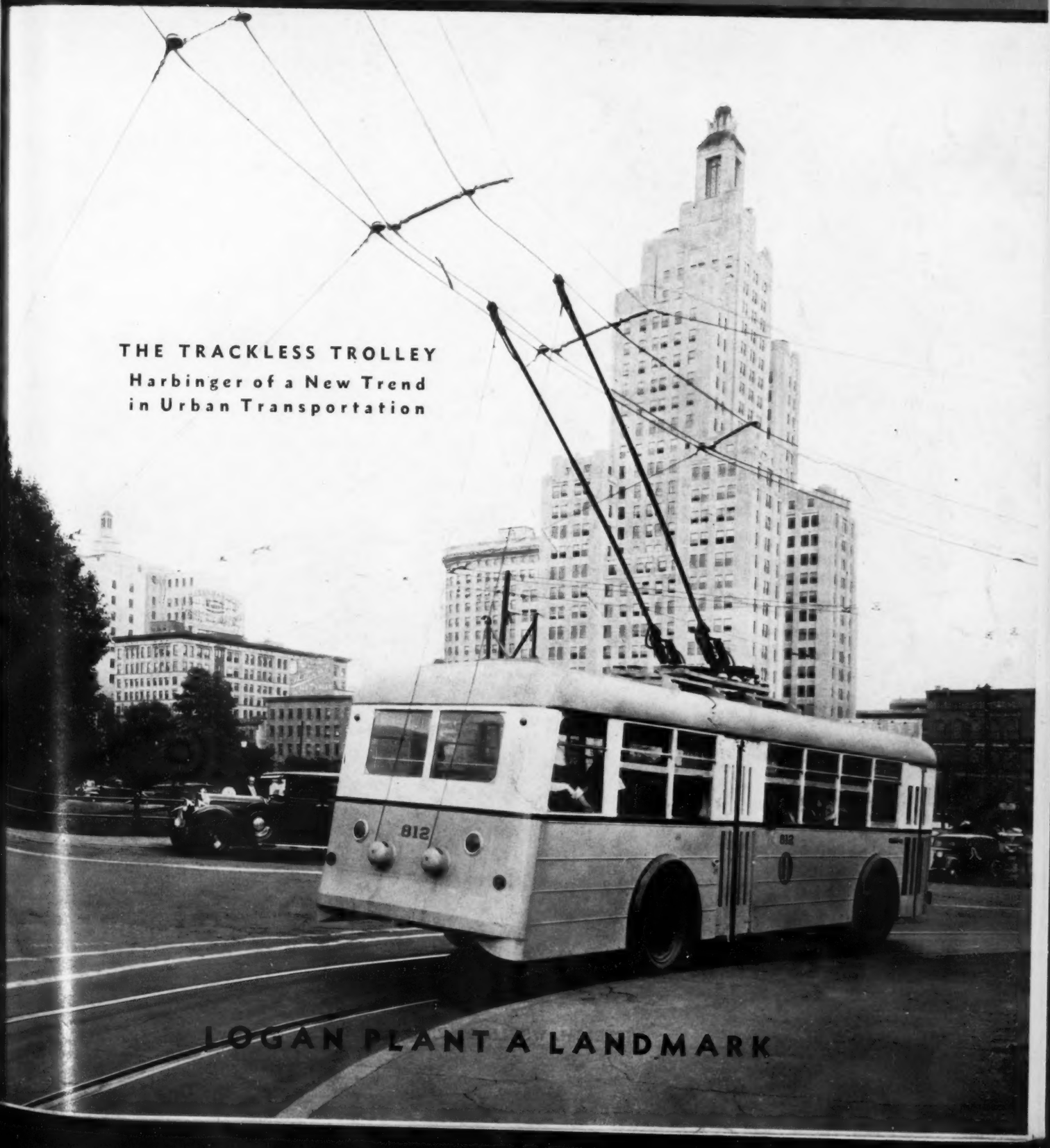

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Reader's Guide to This Issue

Authoritative discussions of timely topics in this issue bring out industry trends and show: The importance of the trackless trolley load as a source of revenue. How the superposition turbine is being used in modern steam station design. What is being done to take advantage of the impulse insulation value of wood to protect transmission lines in lightning areas. How the public relations problem may be tackled by "humanizing" the industry through employees. What the utility spirit means to employees. Where trends in output and revenue are pointing. What it costs to ground lighting structures.

•

Of Executive Interest

Trackless Trolley Load Too Valuable to Ignore—Father and Son—Operations Still Rising—Carter Field on Washington Events.

•

For Power Company Engineers

Logan Steam Plant a Milestone—T.V.A. Chooses Wood in Lightning Area—Cable Power Factor Greatly Improved — Lighting Standards Grounded at Low Cost.

•

On Power Company Sales

Trackless Trolley Load Too Valuable to Ignore—Father and Son—She Became a "Grunt"—Laundry Data Sheets—Operations Still Rising.

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For Electrical Engineers

Logan Steam Plant a Milestone—Cable Power Factor Greatly Improved—Control for Mercury-Arc Rectifiers—Laundry Data Sheets.

•

For Electrical Manufacturers

Trackless Trolley Load Too Valuable to Ignore—Cable Power Factor Greatly Improved—Lighting Standards Grounded at Low Cost—T.V.A. Chooses Wood in Lightning Area—Logan Steam Plant a Milestone.

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Prevailing Saturations

Some interesting statistics are presented in this article on the extent to which the major household appliances are in use on the lines of some 90 power companies.

•

Fool-Proof Hydro Plant

In Idaho there is a new 10,000-kva. robot hydro station that is controlled by one operator from a point 4 miles away. This article tells of the engineering features of the station, which boasts a dam that adjusts itself to head and temperature automatically.

•

Direct-Current Transmission in France

A comprehensive discussion of the transmission aspects of the long-standing generators-in-series-scheme being used in France is presented in this article.

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Today's Steel Mill

Thorough coverage of the innovations in design and equipment and the advanced uses of electric power in the new blooming and strip mills of the Ford Motor Company at its River Rouge Plant is given in this article.

ELECTRICAL WORLD—Published every Saturday. Price 25 cents a copy. Subscription rates: United States, Canada, Mexico, Central and South American countries, $4 a year; all other countries, $6 or 24 shillings a year. Entered as second-class matter, January 20, 1907, at Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U.S.A.

Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga. Printed by The Schweinler Press, N. Y.

VOLUME 106 . . . NUMBER 14

Contents Copyrighted, 1936, by McGraw-Hill Publishing Company, Inc.

McGRAW-HILL PUBLISHING COMPANY, INC.

330 West 42d Street, New York, N. Y.

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PUBLISHED EVERY SATURDAY

APRIL 11, 1936

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Progress All Along the Line—

Constructive progress all along the line characterizes the electrical industry at this period. There is a steady growth in output and current earning reports show better profit margins despite higher expenses. Flood disasters put a heavy burden of operating expense on some utilities, but, in a sense, this is offset by the favorable public sentiment engendered by the devoted efforts of utility employees to save lives and give service. No positive change exists in the political and legal status of affairs except a new impetus is given to more federal power projects on the plea of flood control.

Credit conditions for utilities are splendid. Interest rates are low because ample investment funds exist and the volume of high-grade securities is limited. Utility refunding of bond issues is being made on a large scale, with a consequent reduction in fixed charges. Conditions are favorable for the sale of preferred stocks at low interest rates. Competent financial opinion favors taking advantage of these conditions. Utilities should now raise new capital for expansion in addition to refunding existing obligations.

Advice that the industry should "tell and sell" is strengthened by the recent report of the Federal Power Commission on legal actions by utilities. Since 1931 there were 186 endeavors to get restraining orders or injunctions against public authorities to prevent competition or injury to utilities. Add this cost to the enormous cost involved in federal investigations, changing accounting systems and filling out questionnaires and an astounding expense is had which sooner or later will be paid by ratepayers and taxpayers. This total bill should be computed and publicized.

On the sales side of affairs rapid progress is being made. At least eight utilities now have an average use of 1,000 kw.-hr. per year for domestic customers, and we expect to find at least eight more at this level by the end of the year. All utilities should be aggressive in sales and should join with the co-operative sales programs recently announced. There is a great deal in the slogan "sell your way out of trouble."

Plans are under way for the annual conventions of the electrical industry. Our insert in this issue tells how we plan to aid the industry in connection with the Edison Electric Institute convention. The program already has met with cordial approval and support and we hope the insert will bring out many helpful suggestions. Like the industry, we face new conditions. This insert is a departure from tradition. But it is human and it is warranted.

We had another human reaction after reading over the pages of this week's issue. All the articles stand out in quality and flavor. There is both technical and human interest. There is diversity. The fact that careful editorial seeking brings such a brilliant galaxy of contributions in a single number is indicative of a revived and courageous industry.

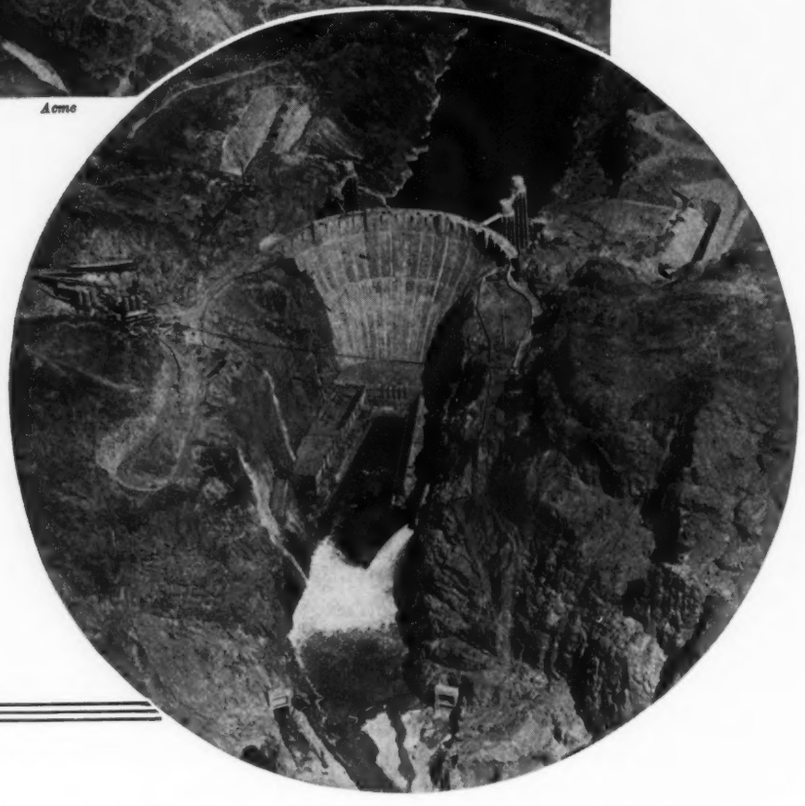
Because of more encouraging conditions we have many new features in store for the future. We are happy to make plans for expansion and improvement because we are human enough to be proud of our jobs and of our opportunities for service. Industry prosperity means our prosperity if we measure up, and the present upturn puts a creative urge into our editorial work. We, too, look for progress all along the line.

Fred Morrow

Editor

Acme

Turned over to the government on March 1, two years ahead of schedule, the Boulder Dam project is now in the final stages of development. With work on the power houses under way in earnest, it is expected that the power lines will be energized early in July.



BOULDER PROJECT NEARS COMPLETION

Logan Steam Plant— A Landmark

Superposition Using 40,000-Kw., 925-Deg., 1,250-Lb. Hydrogen- and Water-Cooled Generator to Operate at 3,600 R.p.M. — Analysis Back of Design Decisions

By PHILIP SPORN

Vice-President and Chief Engineer American Gas & Electric Company

THE present Logan plant is one of a group of four principal steam plants of the Appalachian Electric Power Company, the others being Glenlyn, Cabin Creek and Kenova. The Appalachian Electric Power Company is solidly interconnected at 132,000 volts with the other principal subsidiaries of the American Gas & Electric Company and their main plants are Philo, Windsor and Twin Branch. This interconnected system, while composed of definitely and clearly divided operating companies, is nevertheless co-ordinated from an operating viewpoint.

From time to time the system has been carefully studied from the standpoint of where the capacity could best be added when needed. As a matter of fact, this is almost a continuous process. This always resulted in an answer to extend the present plants as against building a large new plant at some location on the system, up to the point where the total load would be approximately twice its present value. This was true not only from the standpoint of cost per kilowatt of additional capacity, but particularly so from the standpoint of transmission system and service area protection. Hence, when it became evident toward the end of last year that additional capacity would be needed to meet expected loads during the dry water period of the 1937 hydro season, capacity extension studies were confined to purchase considerations and to studies of enlargement or modification of existing plants, with the final decision to superpose at Logan.

Logan was picked because: (1) It was the least efficient of the four major plants on the Appalachian system; (2) it is excellently located with reference to the load center and interconnected transmission facilities; (3) it involved the least building changes and the least rebuilding of electrical layout; (4) economical superposition gave a block of power at Logan which possibly for several decades to come would definitely complete the station from a capacity standpoint, and finally (5) while the extension at Logan gave the most economical increment of capacity, it could be justified regardless of capacity on the savings that could be made by transferring loads to this revamped plant.

Choosing pressure and temperature

In choosing the pressure, temperature, unit size, boiler and heat cycle for this job of superposition certain factors gathered from previous experience, or developed and brought to light during the past six years, were definitely kept in mind. Among these were: (1) The general satisfactory operation of 1,250-lb. boilers and tur-

The road of progress of central-station service—of economical power generation, in other words—is marked by definite milestones. Among others, these stand out clearly: Pearl Street, Fiske Street, Windsor, Lakeside, Philo, Edgar, the mercury unit at Dutch Point, Deepwater, N. J., and the 1,000-deg. unit at Trenton Channel. One of the unfortunate results of the depression has been the lengthening of the time interval in the erection of these markers of progress. Happily, this period seems definitely behind us. The utility industry has again started on a cycle of expansion of its power plant facilities. This new period bids fair to witness the creation of a new series of milestones fully as significant in the new era as the old were in theirs. In that proud series Logan hopes to take its place.

It is fully realized that it is best in matters of technical progress to let descriptive effort wait upon the accomplishment of aims sought, but Logan will combine so much that has been developed and discussed in the past six years, and the announcement of the preliminary facts in regard to the job has aroused so much interest and discussion, that it has been thought best to give a concise and authentic statement of the aims and ends sought.—PHILIP SPORN.

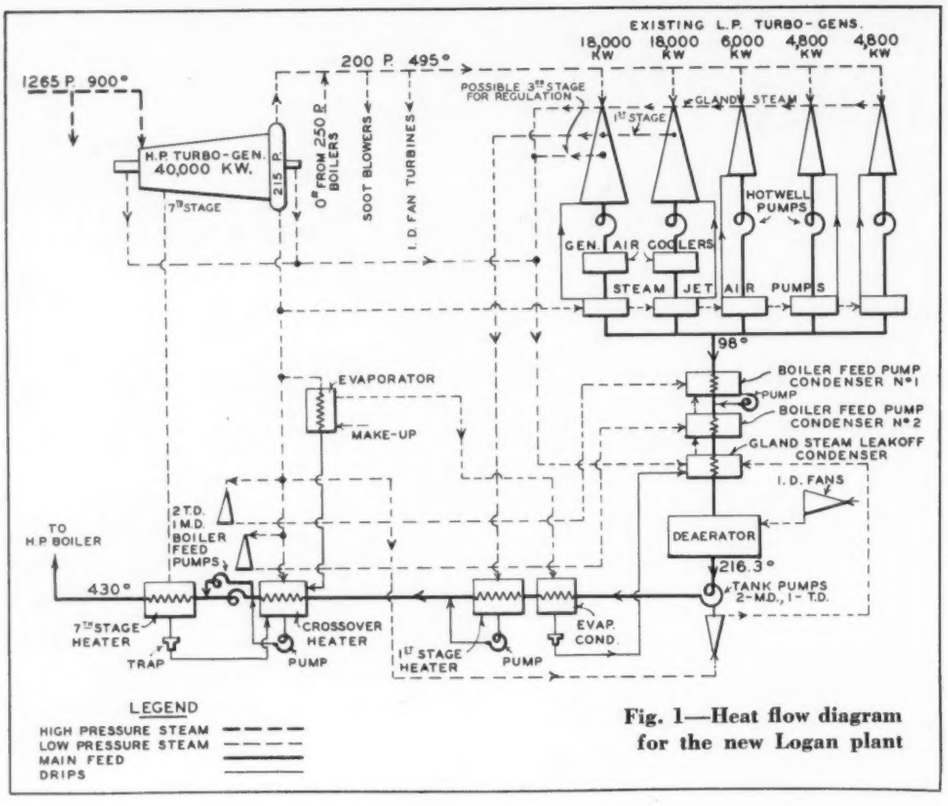


Fig. 1—Heat flow diagram for the new Logan plant

bines as shown by Deepwater and other plant disturbances; (2) the improved thermodynamic performance possible by increased temperature; (3) the elimination of reheat made possible by going to a 900-925 deg. initial range of temperature to bring about piping simplification; (4) the conviction that a single high-pressure unit was absolutely necessary to save capital cost; (5) the space limitations which compelled adopting a single boiler unit for the generation of a million pounds of steam; (6) the lack of low-pressure capacity which, of necessity, called for a maximum ratio between high-pressure and low-pressure capacity to develop the block of power desired and incrementally available on an attractive basis, and finally (7) the conviction that the art of power generation had progressed to the point where a single boiler and generator installation could be made to give an availability of 95 per cent. All of these units should be remembered in considering the details of the Logan cycle, units and boiler.

Aim maximum increment

The aim then, in short, was an economical superposition scheme yielding the maximum amount of incremental capacity available on an attractive basis. To do this resort was had to new developments in turbines, alternators, switching and boiler size for the particular pressure and temperature conditions. Obviously for an arrangement of this kind to be successful, maximum reliability and availability have to be maintained. The various steps taken so far assure this.

Description of superposed cycle

Logan plant at present consists of two 20,000-kva. turbo-generators operating at a pressure of 260 lb. and a temperature of 580 deg. F. There are also two 5,000-kva. turbo-generators designed for 200 lb. pressure and 480 deg. F., which have not been operated for about six years. The first stage nozzles of the 18,000-kw. units will be replaced in order to obtain the increased steam flow through the turbines required by the future lower steam pressure and temperature. The two small units will be reconditioned and placed in first-class condition. A 40,000-kw. high-pressure unit will exhaust at 200 lb. absolute pressure into the present four low-pressure units and into a fifth 6,000-kw. machine which is to be moved to the Logan station from one of the other plants.

The new high-pressure 1,000,000-lb.-per hour boiler will take care of the entire plant. Three of the present boilers will remain and these will be capable of furnishing sufficient steam to operate the two 18,000-kw. and one 6,000-kw. low-pressure units now operating in the station.

The revamped station will have a total capacity of 96,100-kw., 44,500 of capacity in the high-pressure turbine and 51,600 of capacity in the low-pressure turbines. The usual ratio between the high-pressure and the low-pressure section is roughly 2:3. However, it is interesting to note that in the case of Logan the ratio will be considerably higher, about 1:1.16; this high ratio will be obtained by using steam-driven boiler feed pumps and fans by liberal bleeding. This is shown in greater detail in Fig. 1, which shows a preliminary heat-flow diagram of the new cycle. As will be noted, the cycle of steam flow is extremely simple: A single crossover pressure of 200-lb. supplies all five low-pressure turbines, the fan turbines, boiler feed pumps, steam jet air pumps, evaporator and the crossover heater. The high-pressure turbine is bled at the seventh stage into the only high-pressure heater used. This cycle, it is expected, will give a heat reduction from an average of 23,000 B.t.u. per kilowatt-hour output to 12,000 B.t.u. or a decrease of about 48 per cent.

Turbo-generator details

The new turbine will be rated at 50,000 kva, or 40,000 kw. at 80 per cent power factor, three phase, 60 cycles, 3,600 r.p.m., and will have a throttle pressure of 1,250 lb., at a temperature of 925 deg. F. The turbine will have an inner and outer casing and the exhaust steam at about 200 lb. pressure will surround the inner casings so that the outer casings will be subjected to about only 200-lb. pressure. The unit will have eleven stages, with bleeding at the seventh stage. The six first-stage nozzles will be distributed about the periphery of the nozzle head and fed by six control valves coming off a common manifold or header located below the turbine room floor and supplied by two main pipe feeds coming from the superheater to the two throttles located at each end of the manifold. All this gives the necessary evenness of steam

temperature to the entire group of control valves. The oil pump will be driven from the generator shaft and will be located in the basement. This is along the lines already adopted in some recent installations to reduce the fire hazard.

The governing will center about maintenance of a fixed back-pressure under the control of a pressure regulator so that the high-pressure turbine will follow low-pressure unit loadings instead of having load on the low-pressure units controlled by the high-pressure governor. This will minimize any possibility of hunting between the low-pressure units.

In obtaining a large 3,600-r.p.m. machine the fundamental difficulty has always been the limitation in the maximum size of alternator capable of operating satisfactorily at 3,600 r.p.m. All this was a real difficulty so long as air was used as the cooling medium, but with the introduction of hydrogen this difficulty automatically disappears and a new range of sizes in 3,600 r.p.m. is opened up, showing, for the present, limits of possibly 75,000 kva. There was no difficulty, therefore, in obtaining the 40,000-kw., 80 per cent power-factor machine needed to carry out a proper superposition job in this case. With the background of experience on our eight hydrogen - cooled synchronous condensers, going back to 1928, we did not hesitate to adopt hydrogen cooling for this alternator. In addition, more direct cooling of the iron and windings in the stator will be resorted to in this machine by the use of so-called "water pads," so that hydrogen and water will really be the cooling media for the machine.

The stator will have the conventional air duct spaces in the armature coil; these will not be empty, but will be filled by hollow pads through which water is circulated to take away the stator heat. Armature coil and windings and the rotor windings will be cooled by the circulating hydrogen gas. The gas will pass through the armature coil and windings, and by means of fans at each end of the rotor will be drawn through the gap between the rotor and stator punching. A sufficient number of water pads at the central portion of the armature core will have radial fins welded to them, over which the hydrogen gas passes; the heat in the hydrogen is removed by water passing through the pads. Use of hydrogen cooling on this machine reduces the heating and windage losses by about 450 kw. under that of a conventional air-cooled machine of the same rating. Generator shell construction will be, in principle, similar to the construction employed in the hydrogen-cooled synchronous condensers, with emphasis laid upon keeping the hydrogen leakage at a minimum and having the shell explosion-proof.

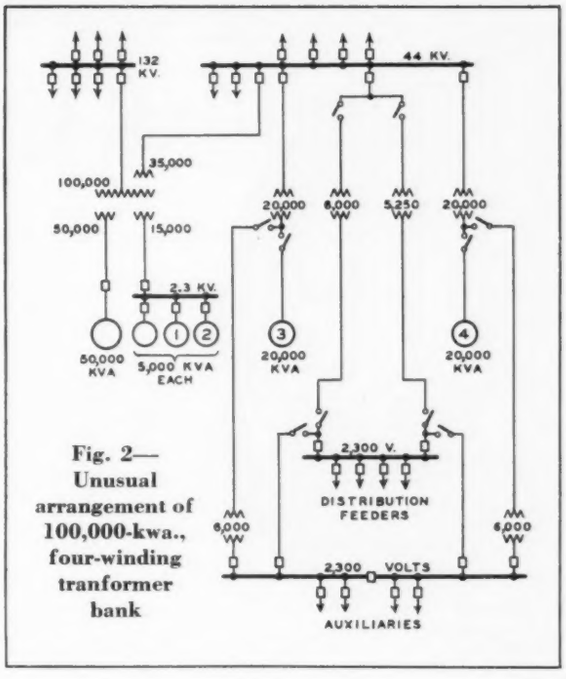


Fig. 2— Unusual arrangement of 100,000-kwa., four-winding tranformer bank

Much work has been done on the American Gas & Electric Company system in the use of vacuum tubes in connection with generator and synchronous condenser voltage regulators, and in one case a large synchronous condenser is completely excited by tubes, and another 36,000-kva. condenser is now being installed utilizing vacuum tubes for excitation. However, the Logan machine will not be vacuum-tube excited. The possibility of using vacuum-tube excitation for this unit was carefully studied and finally abandoned for the reason that the tube exciter normally obtains its power from the geenrator terminals. In the case of a generator this means that if trouble occurs to cause a failure in the a.c. source of power to the tubes the generator excitation will be lost, and this, in effect, would mean the loss of the geenrator to the system. The present low-pressure machines have a rather complicated, separately driven excitation system. This was discarded in the superposed job and a complete excitation system developed for all six units, utilizing two main and one pilot exciters, which are driven from the main generator through a reducing gear. One main exciter will furnish the excitation for the low-pressure units at 125 volts and the other main exciter will furnish the excitation at 250 volts for the high-pressure unit. A common pilot exciter will furnish the excitation requirements for both the main exciters.

Electrically, the output of the station will be taken by one new 100,000-kva., four-winding transformer bank. This is shown schematically in the simplified tentative one-line diagram of Fig. 2. It will be observed that the new high-pressure unit is connected to one winding of this four-winding bank, that the three small units are connected to a 2,300-volt winding, that a third 44,000-volt winding makes a tie between all these units and the 44-kv. bus, which at present take the output of the two 20,000-kva. low-pressure units. The entire output from all these buses is tied in through the largest of the four windings to the existing 132-kv. system supplying six 132-kv. circuits feeding north and south out of Logan. This, it will be noted, gives a very compact but fully flexible arrangement for handling the station output.

Boiler details

Three fundamental specifications were given the boiler manufacturers as a basis for boiler design, with their relative importance stressed in the order given below:

(a) *Reliability and Availability*—A definite request was made for a boiler design which would have an availability of 50 weeks out of 52, with some leeway as to the time when it would be necessary or desirable to utilize the two weeks' annual outage.

(b) *Space Economy*—This definitely restricted design to a single unit.

(c) *Capital Cost Economy*—This latter was particularly important, since Logan is located in a low coal-freight zone, which meant that B.t.u. economy, justifiable in areas where the freight item runs from $2.50 to $3 per ton, could not be justified here with coal available at a 7-cent (switching charge) freight rate.

The final boiler chosen will have a rating of 1,000,000-lb. of steam per

[*Continued on page 98*]

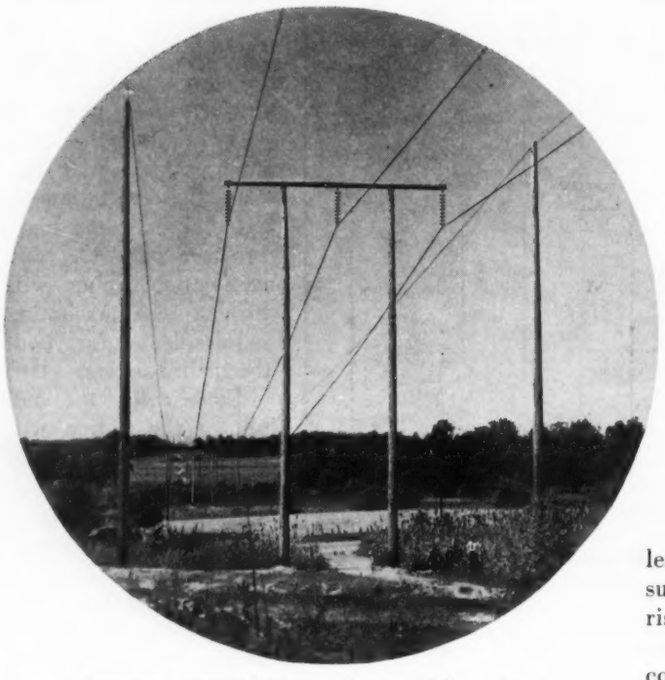
T.V.A. Chooses

By

LLEWELLYN EVANS
Chief Electrical Engineer

and

H. C. DANIELS
Electrical Engineer
Tennessee Valley Authority



Separate ground-wire poles on T.V.A. line set 60 ft. apart

154-kv. T.V.A. line from Wilson Dam to Norris Dam (230 miles) uses wood-pole construction on a 96-mile section. Tangent suspension structures on 550-ft. average span. Crossarm is 33-ft. round spar. Conductors spaced 16 ft. Conductor to ground wire pole separation is 14 ft.

CONSTRUCTION of the Norris storage dam on the Clinch River, about 20 miles north and west of Knoxville, Tenn., was begun in the fall of 1933 as an aid to navigation and flood control on the Tennessee River. The flood surcharge capacity of the dam is 1,300,000 acre-feet and the normal storage available for release during the dry summer and fall months in aid of navigation is 1,500,000 acre-feet.

The firm capacity of the hydro-electric plant at Wilson Dam, as well as navigation depth on the Tennessee River, is limited by the minimum stream flow during the dry months of the year. Both purposes require the release of water stored at Norris Dam at the same season. It was found economically advantageous to install hydro-electric generators at Norris Dam and release the stored water through the machines as needed for navigation, resulting in increasing the firm electric power of the combined Wilson and Norris Dam plants.

Such use of these plants to secure the maximum combined capacity and output requires the interchange transmission of power between the two plants equal to the installed generating capacity at Norris Dam (100,000 kw.) less the load to be supplied in the Norris area.

It was decided to construct the first circuit for a capacity of at least 50,000 kw. For the transmission problem thus laid down the economic voltage was found to be 154 kv. and the conductor size 400,000-circ.mil copper or equivalent.

To operate the two plants so as to secure the maximum amount of firm power from their combined use dictates that the tie line between them shall be, in effect, a bus and, as such, must have extreme service reliability. The quantity hazard on a line of this length, partly over rough mountainous country and partly over rolling valley territory, in an area subject to frequent and severe lightning disturbances (isoceraunic level 60) made the selection of supporting structures for the line a stringent problem. The lightning season overlaps with the low stream-flow period, when uninterrupted transmission is of paramount importance. Therefore, the greatest economically feasible immunity from lightning was considered the most important factor in the design of the line.

A lightning protection level of 20,000 kv. was chosen as the aim of the design; that is, a line which would withstand direct lightning strokes up to 20,000 kv. without interruption to service. The probability of direct lightning strokes of more than 20,000 kv. to the line in this area, where the isoceraunic level is 60, is 0.8 stroke per 100 miles of line per year, and the probability of strokes of higher potential does not materially decrease this figure, the probability curve being practically asymptotic above this potential.

A searching analysis and study of the conventional types of construction used for 154 kv. and higher voltage lines was made and consultations held with many experts on power transmission. Reliability of service and particularly immunity from interruptions because of lightning were stressed throughout.

Engineers are critical enough to ask that anything new devised to thwart lightning while welcomed must be justified by calculation and test. These T.V.A. engineers have made a departure, there is much interest in their design and in the reasoning which led to the decision. All aspects are covered here and in a manner that we rate as a pretty conclusive presentation. Those who dissent will undoubtedly be heard. Those who agree should also speak out. Lightning is still plenty formidable.

Induced surges of little consequence

A design which keeps line outages from direct lightning strokes to a minimum requires adequate shielding with at least two overhead ground wires, sufficient spacing between ground wires and conductors at midspan to prevent flashover after the ground wire has been struck and co-ordination

Wood in a Lightning Area

New Types of Structures Devised and Tested for Portion of 154-Kv. Line (Wilson to Norris Dam) Severely Exposed to Lightning

of tower footing resistance and line insulation such that a stroke to the tower will not cause a voltage rise of the tower top above ground potential sufficient to cause a flashover from the tower to the line conductors. Satisfying these conditions requires an insulation level so high that the voltages induced in the power conductors by lightning discharges or surges and the operating voltage are of small consequence.

Since by far the greater proportion of lines constructed for 154 kv. or higher voltages are supported by steel towers, the requirements of this type of construction received first attention.

The following preliminary assumptions were made to determine the general features of the towers required:

Single circuit steel towers.
Two overhead ground wires.
1,000-ft. spans.
Tower surge impedance 100 ohms.
Ground wire surge impedance 350 ohms.
Protection level 20,000 kv. direct stroke.
1 microsecond lightning wave.

The calculated maximum potential of the tower top for a direct stroke to the tower and the corresponding voltage across the insulator string for various values of tower footing resistance were as follows:

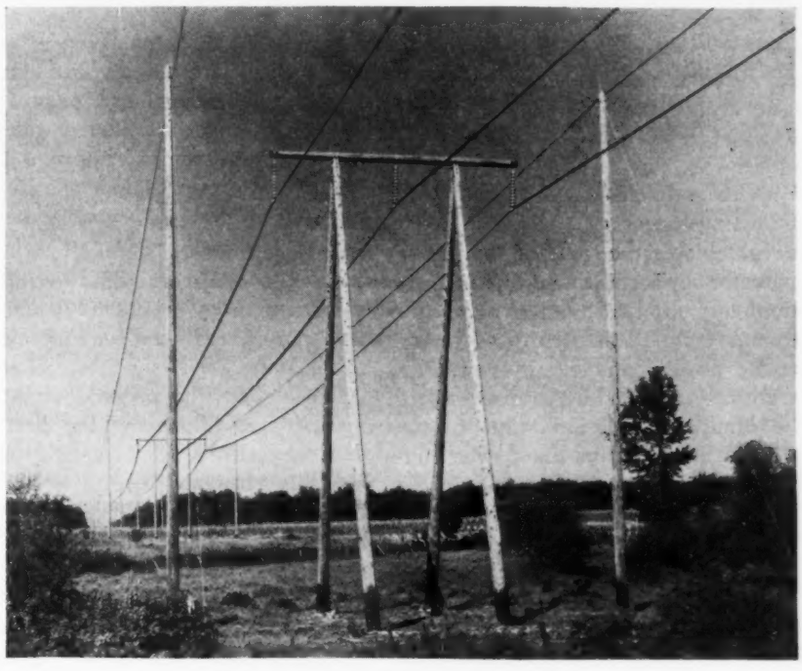
Tower Footing Resistance	Maximum Potential of Tower Top (1 Microsecond Wave)	Voltage Across Insulator String After 2 Microseconds
0 ohms	2,000 kv.	1,400 kv.
5 ohms	2,750 kv.	1,925 kv.
10 ohms	3,440 kv.	2,408 kv.
15 ohms	4,000 kv.	2,800 kv.
20 ohms	4,600 kv.	3,220 kv.
50 ohms	7,200 kv.	5,040 kv.
100 ohms	9,650 kv.	6,755 kv.

Some ground resistances run high

The impulse flashover voltage of a string of suspension insulators 120 in. long is about 2,400 kv. at a time lag of 2 microseconds. It is seen that this value corresponds to the voltage across the insulator string under the assumed conditions for a tower footing resistance of 10 ohms. This would require an insulator string of 24 suspension units of 5-in. spacing and a striking distance to the tower under conditions of normal side swing of the conductors of 11 ft., which is substantially the design of the Boulder Dam-Los Angeles lines. It was not considered practicable to provide more than this amount of insulation with the correspondingly larger structures. Consequently, it was assumed that tower footing resistances not exceeding 10 ohms would be provided and design studies were continued on that basis. A spot check at approximately 10-mile intervals along the route of the line showed individual ground resistances ranging from 20 to more than 3,000 ohms and indicated the probable necessity of installing parallel ground counterpoises in sections of unusually severe exposure.

The large amount of insulation and the large size of steel towers required to obtain the desired lightning protection level logically led to the consideration of wood-pole structures to take advantage of the impulse insulating value of wood.

The only wood-pole structures which had been used on high-voltage lines were of the conventional H-frame type, usually with two overhead ground wires carried above the power conductors and with connections from the ground wires down each pole to ground. With this type of construction it was found that the amount of insulation necessary could be reduced by the impulse insulation of the wood crossarm member, the limit being the insulation necessary to keep leakage currents below the point at which wood crossarms would be burned, but that the same striking distance from the conductors to the ground connections on the poles as required to steel tower members was necessary. Minimum length of crossarm which would satisfy these conditions was about 44



Double A-frames at suspension dead-ends

Installed at 2-mile intervals. Crossarm is 33-ft. round spar. Strength provided by A-frames anchored against uplift, heavy crossarms and high-strength insulators and clamps; ground wire poles guyed.

ft. The difficulty of obtaining timbers of sufficient size and their high cost made it impracticable to use such construction. Use of poles or round spars for crossarms was considered and found practicable from the standpoint of supply and cost, but no satisfactory means of attaching them to the upright poles, which must extend above them to support the ground wires, could be found.

It was found feasible to use a round spar for a crossarm provided it were installed on top of the supporting poles similar to a gate post arrangement. However, this method of mounting left no satisfactory way to support the ground wires higher up on the same structure and led to consideration of supporting the ground wires on separate poles on either side of the power conductor supports. Such construction, completely eliminating all ground connections from the structures supporting the power conductors, opened up an entirely new field of investigation. The impulse insulation value of the entire structure from the power conductors to the ground line was in the path of a discharge from the conductors to ground. Calculations indicated that a crossarm length of 30 ft. with a correspondingly decreased striking distance from the conductor to the supporting pole would provide the insulation level desired. The provision of sufficient striking distance from the conductors to the grounding connections of the ground wires was merely a question of setting the ground wire supports the proper distance laterally from the line. Shielding could be obtained by selecting the proper heights of ground wire poles.

Double A-frame at dead-ends

The problem of dead-end structures for such a line presented further difficulties. A tentative design was made consisting of a four-pole guyed structure with increased horizontal spacing to increase the flashover voltage and with the two outer poles extended in height to support the ground wires. The crossarm was 60 ft. long and attached to all four poles.

Comparative estimates showed the cost of this construction to be about the same as for a conventional H-frame line of similar characteristics and appreciably below the cost of steel tower construction.

The next step was to erect full-sized structures as tentatively designed and test them mechanically. Both round spar and double plank trussed crossarms were tested. In the unguyed H-frames both types of arms were found to have greater strength than the poles and either could be used equally well from the mechanical standpoint. A line pull of 2,000 lb. at the outer conductor support caused sufficient distortion to split the pole tops in each case. Under vertical loading the arms showed approximately the same strength, each type failing at about 7,500 lb.

On the four-pole guyed dead-end structure the plank arms failed in the splice at the middle conductor support at a line pull of 6,700 lb. and the hardware failed at the outer conductor support at 5,900 lb. The spar arm failed in the splice at the middle conductor support at 7,400 lb., while at the outer support the testing rig showed distress at 10,000 lb. and the test was discontinued without damage to the spar.

Throughout the mechanical tests the necessity of improving the hardware and connections was clearly apparent.

While structure studies were being made bids had been taken and contracts let for conductors and insulators. The conductor purchased was 636,000-circ.mil aluminum cable, steel reinforced. For suspension structures Jeffery-Dewitt No. 2511 insulators were purchased, and for stabilizing points, heavy angles and dead-ends "Pyrex" No. 65234 insulators were purchased.

Insulation co-ordination tested

With a structure which was satisfactory mechanically and knowing the insulators to be used on it, the problem of insulation co-ordination was next attacked. Arrangements were made to set up full-sized structures in the high-voltage laboratory of the General Electric Company in Pittsfield, Mass., for impulse flashover tests.

The four-pole dead-end structure with spar crossarm was tested first. The spacing of conductors and length of insulator strings was varied until the maximum flashover voltage was obtained. All insulator strings were tested in the suspension position, it being intended to use this type of conductor support on stabilizing structures with sufficient insulator and structure strength to withstand dead-end loads. A total of fourteen tests were run on this structure, mostly with Pyrex insulators, because their higher strength was required for dead ends. The best balance was obtained with strings of eleven insulators and conductor spacing of 264 in., which flashed over at 1,700 kv. with a 2x50-microsecond positive wave in 43 microseconds. Increasing the insulator string to fifteen units with the same spacing gave a maximum flashover voltage of only 1,760 kv. in 4 microseconds. For purposes of comparison Jeffery-Dewitt insulators were substituted and with other conditions the same the best results were obtained with ten units per string, flashover occurring at 1,660 kv. in 3.5 microseconds. It was apparent that the desired insulation level could not be obtained with this structure unless its physical dimensions were materially increased. This being impracticable, further tests were abandoned.

Flashover voltages determined

Flashover tests on the simple H-frame with spar crossarms and separately supported ground wires immediately showed that the calculated spacings were inadequate. As the spacing and insulation were varied to obtain the best co-ordination, it became necessary to use a shorter and faster voltage wave to obtain flashover. The best results were obtained with strings of nine Jeffery-Dewitt insulators, a conductor spacing of 216 in. and an air gap of 166 in. from conductor to ground wire, at which the conductor flashed to the ground wire at 2,635 kv. with approximately a 1.5x40-microsecond wave. With Pyrex insulators eleven units per string with the same spacing flashed over at 2,495 kv. with a 1x36-microsecond wave. The impulse insulating value of the wood members was shown during the latter test by bonding the hardware on the structure, flashover occurring at 1,600 kv.

Similar tests on the H-frame suspension structure with double plank trussed arms and the same spacing showed a flashover voltage of 2,495 kv. with eleven Pyrex insulators per string and 2,300 kv. with nine Jeffery-Dewitt insulators per string. Since most of the line structures were to be of the suspension type with Jeffery-Dewitt insulators, the spar crossarm was selected because of the higher insulation level which it afforded.

The spacings used in the test gave flashover voltages somewhat higher than were considered necessary and it was decided to reduce the size of the structure to 16-ft. spacing between con-

ductors and 13.5 ft. from outer conductors to ground wire down leads. The smaller conductor spacing reduces line reactance and thereby increases the capacity of the line for equal voltage drop by about 5 per cent over the capacity of the same line with the spacing required on steel towers.

In order to provide a dead-end structure with insulation equal to that of the suspension structure it was necessary to eliminate all guys and ground connections. The structure finally selected was similar to and of the same size as the suspension structure, the single-pole supports merely being replaced by substantial A-frames and a correspondingly heavier crossarm was used. It was found necessary to provide pole anchorages practically equivalent to tower footings to prevent overturning. This structure was tested to a line pull of 10,000 lb. per conductor without failure. The ground wire poles were guyed at dead-end structures.

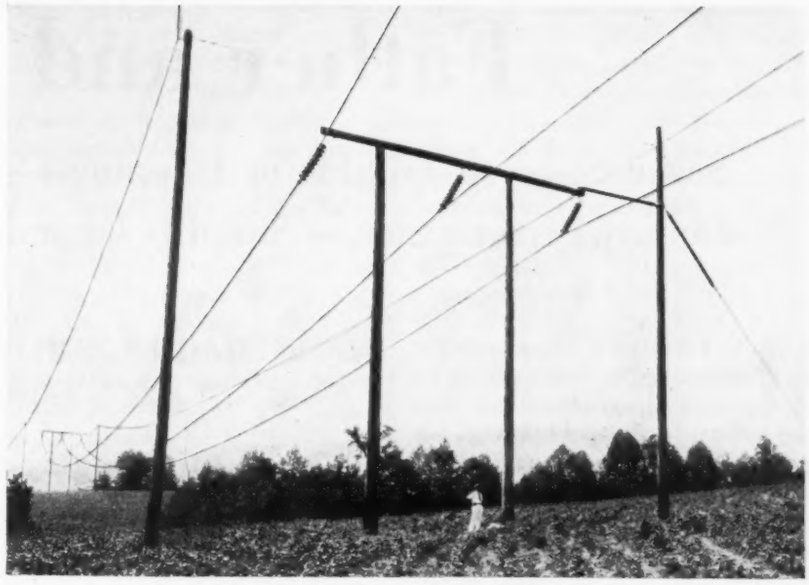
The insulation level was maintained at angle structures by connecting the end of the crossarm to the ground wire pole through a 12-ft. wood strain insulator and inserting another 12-ft. wood insulator in the guy to ground.

Ground wires on separate poles

A maximum conductor tension of 5,500 lb. under heavy loading was selected. In order to increase the mid-span separation of ground wires and conductors to prevent side flashing, $\frac{3}{8}$-in. high-strength steel ground wire was selected and strung for a maximum tension of 5,150 lb. Shielding the power conductors from direct lightning strokes from clouds 500 ft. or higher above ground required ground poles 10 ft. higher than the crossarm. This placed the ground wires about 15 ft. above and 13.5 ft. laterally from the nearest power conductors at the structures, a separation of about 20 ft. The striking distance from conductor to ground at the structure with insulators hanging vertically is 13.5 ft. and with insulators swung 30 deg. the striking distance is about 10.7 ft. The mid-span separations of ground wires and conductors at 60 deg. F. are as follows:

Span, Ft.	Separation, Ft.	Span, Ft.	Separation, Ft.
400	22.9	800	32.0
500	24.7	900	35.6
600	26.8	1,000	39.4
700	29.3		

A special high-strength pole band was developed and used for all connections and attachments on the structures except the ground wire support, where standard hardware was used. This pole band provides the equivalent of a 2-in. band of high-pressure metallic contact around the circumference of poles and crossarms at each point of connection or attachment. All pole tops are protected from the weather by thin, sheet copper covers and there is no wood-to-wood contact between poles and crossarms. The contact area thus provided is thought ample to prevent burning of the wood members by leakage and charging currents.



Angle structure has crossarm offset to maintain proper conductor spacing from poles

T.V.A.'s 154-kv. line has H-frame guyed to ground wire pole by 12-ft. wood strain insulator with another 12-ft. unit in ground guy. Uninsulated guy from top of ground wire pole serves as ground connection, no ground wire down pole. Minimum of 20 ft. of wood insulation maintained between conductors and ground. Long-span side-guyed structure in background.

Counterpoises in contemplation

Although the use of the parallel ground counterpoise was indicated to obtain the low tower footing resistances on which the design is based, it was not included in the initial construction. To improve the grounding, rods were driven in the bottom of ground wire pole holes and left projecting about 2 in. above the bottom of the holes. The down leads were stapled across the butt of the poles, over a thin copper sheet before the poles were set. On setting the poles the rods punctured the copper sheets and established metallic contact between the rods and down leads. After the poles were set the resistance of the individual grounds was measured with the ground wires disconnected and varied from a low of 10.5 ohms to a high of 750 ohms. Operating experience will probably disclose sections of the line where severe exposure makes it necessary to reduce the resistance of the grounds. The grounding can be considerably improved by connecting together below the ground line the grounds of the two ground wire poles at each structure. Where this does not reduce the footing resistance to a sufficiently low value it may be necessary to install the parallel ground counterpoise in some sections of the line.

The line is designed for a minimum clearance from conductors to ground of 25 ft. after the addition of three insulators per string. This provision permits the amount of insulation to be increased if it is desired to raise the line voltage or found necessary to prevent burning of wood members. With the additional insulation the line should operate satisfactorily at 220 kv. unless the leakage and charging currents of the insulators should be sufficient to cause burning. There is no operating experience on which to forecast the results of such operation.

Approximately 96 miles of the line has been completed using this construction and 30 miles of it has been in operation temporarily at 44 kv. since October 13, 1935. Steel tower construction is being used on the remainder of the line.

Father and Son

Seven Steps to Trouble or Happiness—Size No Excuse for Clumsy Performance— Simplify Organization and Be Natural

By RICHARD E. SMITH
Executive Assistant
Southern California Edison Company

MY FATHER was a popular storekeeper. Every one in the valley liked him and men from a distance who came through our town on an occasional business or hunting trip enjoyed dropping in for a casual purchase and a visit. There was time to visit in those days, for the store was open from 7 o'clock in the morning until 9 at night and nobody was in a hurry. My father was well informed on current events and talked well, but he was not supercilious. With a meager Spanish vocabulary and a variety of eloquent gestures, he got along very well with the many Spanish-speaking patrons of the general store and he could converse with a poorly educated farmer in a way he understood.

There was an over-the-counter frankness about all that he did. He knew his goods and he knew his customers. He could give impartial advice about the qualities of cheese or gingham and he could make decisions. I suppose Dad never heard the expression "public relations"; certainly he never went to conventions and listened to speeches on how to get along with people, nor was it necessary.

Putting up a front

As I consider these two men whom I have known so well—my father and his son—there comes a gleam of understanding about some fundamental situations which have made it necessary in these modern times to give consideration to "public relations." Reams have been written about it, conventions have been engrossed with it, specialists have been employed because of it. What is there that I can add to the sound thinking of the great men who have served and are serving this industry? In the interval between Dad's day and mine what has happened to change the relation between a merchant and his customers?

I have a feeling that there is something artificial about all of us who have come into positions even of minor authority. Probably we junior executives are more guilty than our chiefs, for a little glory begets a big front. It would be difficult for me to return to Dad's store and pick up the work where he left it. It would be hard to be natural. I know that I have acquired traits and mannerisms which would be misunderstood. That is why a professional actor is out of place in a group of ordinary men and women; he has lived so long in an artificial environment, so much of his life has been devoted to pretense and make-believe, that he cannot be natural. That is why the politician is so transparent to the discerning person.

The difference between Dad's general store and the company which employs me is, for the greater part, a matter of dimension. His annual sales amounted to a few thousand dollars; ours are measured in millions. He operated in a little town; we are spread over ten counties. But, in their fundamentals, there is no difference between the two enterprises. The neighborhood needed what he had to sell. Among other items, he sold kerosene; we sell electricity for the same purpose. Likewise, Dad's problems were different from those of a corporation president only in degree. My superiors do their worrying in millions, while Dad measured his in tens. But that ten dollars was important and the same mental processes were required to decide how it would be handled. Dad was the president; he had to decide. There was no one to whom he could pass the buck. And that is how he and the druggist and the blacksmith developed qualities of leadership in their community. Are we developing those qualities in the men and women who meet our customers?

Today I saw a fellow tamping a manhole cover, meanwhile indulging in some banter with a policeman. Both were attending to their duties, both were grinning and having a good time. I thought, "There is the employee who makes our public relations. Between him and the cop there is no restraint. They speak the same language, have about the same income, the same problems of maintaining a home and keeping up their insurance. Whatever the underground man had to say about our company—if that subject were broached—would be accepted without question by the policeman. And the underground man looks like the sort of fellow who would make the best case possible with the information at hand."

In many instances we find that such a man has as boss a foreman who reports to a general foreman who reports to a district superintendent who reports to a general superintendent who reports to a manager of operations who reports to a vice-president. There, in too many cases, is your chain of public relations—seven vital steps between the management which establishes policies and the consumer who is affected by them—the man whose good will we cherish and whose dollar we solicit.

If management could deal directly with the consumer in all aspects of the business, as Dad was able to do in the general store, much of the bugaboo of

public relations would vanish. This has been said before and will be said many times in the future. Some things are so obvious that we must say them. If there are gophers in the lawn, there are just a few obvious methods of dealing with them.

Seven steps to trouble

Let us keep the chain of authority in mind as it exists between the management and the persons who most frequently meet the consumer—the clerk, meter reader, troubleman, collector and salesman. If each of these were thoroughly conversant with all the elements of the business that guide the management; if each were able adequately and clearly to explain all of these elements, and if each were granted reasonable authority to make decisions in the relatively trivial situations encountered in his daily routine, then we should be well on the way to the solution of this perplexing problem.

Later in this paper some typical causes of discontent will be considered, but, before that is done, it seems pertinent to give some thought to the chain of authority or, if you prefer another term, the chain of performance. Seven steps have been mentioned. This will vary as between companies and also as between departments, but, in general, the same common conditions will prevail. Good business practice dictates that some such procedure be followed, and trouble arises only when we give too much thought to the mechanism of organization and too little to its ultimate objective, which is to give the customer what he wants quickly and satisfactorily.

Size alone cannot be blamed for clumsy performance. Large department stores are able to maintain a feeling of intimacy with their customers under conditions quite similar to those surrounding our business. The technical nature of our business cannot be blamed; the widely popular motion picture is also highly technical. Our environment of governmental regulation cannot be blamed. Banks have similar regulations, yet many of them are decidedly popular with their clientele.

What, then, is to blame? Conceding that the management is enlightened and has shed some of the dogma of an earlier day, I suggest that much of the difficulty lies in our unwieldy organization and its complex processes. As a further suggestion I would say that too many of our petty officers have lost the common touch. And as another suggestion I believe the line of communication between management and the rank and file has too many inefficient relay stations, and as a final suggestion I submit that we have withheld from our front-line workers much information which they need for the intelligent performance of their duty.

Much that follows comes from talks with fellow employees, from reading "letters to the editor," from conversations with neighbors, and particularly from the careful study of 200 papers prepared by workers in our company in a recent problem contest.

Causes of complaints

From these various sources it would appear that there are about a dozen rather common causes for dissatisfaction with most of our electric utilities:

1. Keeping the customer waiting.
2. Curtness.
3. Failure to explain carefully and completely.
4. Lack of information.
5. Buck passing.
6. No genuine interest in customers' desires.
7. Hiding behind rules.
8. Unreasonable credit requirements.
9. Demand and minimum charges.
10. Rate structure.
11. Blind billing.
12. Inability to make decisions.

The first group (of seven) rests squarely on the employee and can be corrected only by continuous and consistent instruction right down the line.

A STUDY IN PUBLIC RELATIONS

Some straight talk on public relations by an experienced observer can be put to use by the utility industry. Consider the customer and then build organization, practices and personnel with this in mind. Some practical suggestions to put to work. An outstanding article on a familiar subject.

Remember that one of the best instructors is a good example. It is quite natural to imitate the boss. If he is alert, attentive, patient, honest and polite, little formal instruction will be needed on these points. By "boss" is meant the "straw boss" as well as the "big boss." The collector is influenced by the chief collector and the cashier is influenced by the chief clerk. Too frequently the chief of this or that feels the importance of his principality and it is not surprising to find his attitudes reflected in the performance of his aids. Sometimes a little touch of red-hot discipline at some intermediate point in the line of authority may be beneficial.

Items 8 to 12 in our list head directly into the general office. If the management insists on two pages of fine print being signed and countersigned as a preliminary to welcoming a new customer, then there is nothing for the employee to do but get the signatures. The same applies to rates, charges and billing. However, these conditions do not justify the employee's saying, "I can't help it, lady; it's the rule." Each of these details has a plausible explanation and friction can be avoided if the employee is equipped to give that explanation. That is where we have failed.

Item 12 (inability to make decisions) is best illustrated by a hypothetical case. Suppose that Jim, one of your linemen, is a member of the American Legion and is on the picnic committee. As a stunt, some one suggests a greased pole. The chairman turns to Jim and asks, "How about it?" and Jim replies without the slightest hesitation, "Sure, we'll lend you a pole!" Could that happen in your organization or would Jim hedge by saying, "I'll talk to the boss," who would take it up with the superintendent, who would phone the storekeeper, who would say, "I guess we can get away with it—but make them sign a lease agreement." In such a case, Jim's rating with his associates has been lowered and the pride in his job, which means so much to us, has been weakened.

In an earlier day, with its simpler business structures, the boss in most cases was also the owner. He could be arbitrary and none could say him nay. But in the modern public utility, with its widespread ownership, every one from president to janitor is a worker and none is boss except in so far as he passes along responsibilities and authorities which previously have been delegated to him.

It is imperative that the employees having intimate daily contact with the customers should know this and accept

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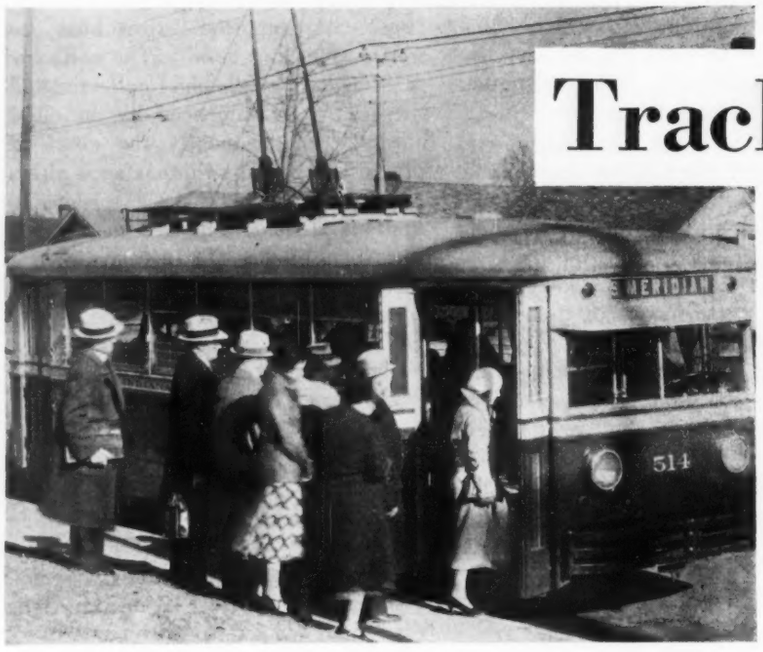


Trackless Trolley

Present 65,000,000 Kw.-Hr. Load Destined to Grow — Riding Public Bestows Increasing Favor and Patronage on New Transit Tool

Indianapolis promises to be the dominant trackless trolley city

CONCENTRATION on the cultivation of domestic and commercial load is one of the current necessities, but the invigorated zeal in these directions is obscuring the merits of some large-lump loads. The trolley without rails is distinctly in this class. With very few exceptions it is being entirely overlooked by power utilities. Nevertheless it is not only a load-retaining and load-reclaiming factor—it is a load-building factor as proved by statistics which reflect its rising public acceptance. The riding public is pleased with the trackless trolley because of its smoother riding and acceleration, faster schedules, more frequent service, safer curb loading, maneuverability in traffic and good light to read by.

Study of the field shows conclusively that the trolley-on-rubber car can reverse and is reversing the trend of electric consumption in the area of transportation. Street and interurban transit generally is using more than a billion less kilowatt-hours now than it did in 1927. Half this loss was borne directly by railway divisions of power utilities and half by independent railways, many of which buy their power from the light and power utilities. Today the transit load represents slightly over 5,000,000,000 kw.-hr. annually—26 per cent less than the 1927 transit peak. Will the power industry complacently watch this load trickle off to other forms of energy and propulsion or will it move to cultivate and encourage this wholesome electric load in such ways as are open to it?

In the first place and approximately a 40-passenger trackless trolley uses from 2.8 to 3.4 kw.-hr. per mile and a 30-passenger bus 2.2 to 2.5. That to a power man may make less impression than to state that one small fleet of 40-passenger vehicles has used practically 2,400,000 kw.-hr. in one year's operation. Including spares, rush-hour service, maintenance outage, etc., this meant 140,000 kw.-hr. per year per "connected-load" vehicle. Car-miles of operation for this particular division totaled to over 800,000 for the period. The energy data include losses from the converter substation as well as light and heat used on the vehicles.

Each of the above railless cars, therefore, represents a power company energy revenue of $1,400 more or less per year. Even if these indexes be taken at more conservative figures of $1,000 for 120,000 kw.-hr. per year they show some startling contrasts with other load-building activities. To equal the same gross revenue an amazing number of household appliances must be established on the power system as can be seen from the following suggestive table based upon $1,000 gross revenue from annual energy sales at typical rates:

	Number	Annual Kw. Each	Hrs. Group	Annual Revenue
Trackless trolley	1	120,000	120,000	$1,000
Water heater	17	3,000	51,000	1,000
Range	25	1,600	40,000	1,000
Refrigerator	50	500	25,000	1,000
Washer	800	25	20,000	1,000

Before acknowledging any of the facts about the public acceptance of the trackless trolley as having appeal over the gasoline bus or the modern trolley car, the power industry is almost certain to stack the rate conces-

There are well over 600 trackless trolley cars in daily operation in this country. Recent commitments will boost the immediate total to at least 750 (Portland, Ore., has 120 on order). Two-thirds constitute a power company load, one that is showing a distinctly rising tendency. If the expected 5,000 rail cars are replaced in the next five years by the equivalent in these electric vehicles a load of 500,000,000 kw.-hr. will be retained to grow. Two of every three urban rail cars that may ultimately be abandoned could appropriately be railless trolleys. In 1935 one was bought for every three new trolley cars and nineteen new gas buses.

This article is designed to dispel some of the horse-and-buggy notions that power people still seem to hold about the street transit load as they have known it.

Load Too Valuable to Ignore

By A. E. KNOWLTON
Associate Editor

sions, the selling expense, the prospects of permanence, the capital outlay to serve and the resulting net revenue from this available load against the corresponding facts and figures for other attainable business. The figures above should provoke some meditation in this direction.

As for capital outlay, there is practically none for the power company to make. In a few instances the center of load of the trackless trolley area has necessitated a relocation of the substation and a relatively short run of new cable. Generally, however, the most that the power company has had to do has been to revamp a substation bus to accommodate both positive and negative terminals, install an extra switch or two and remove a ground or rail connection. Meanwhile, the transit companies are not hesitating to spend money for four No. 2/0 wires and wholly new supports where they may have had only No. 1/0 single trolley before. Nor are they demurring at paying a shade more for the vehicle than for a gas bus. They confidently expect to save handsomely in operation and maintenance and to stimulate new riding.

That the railless trolley is making a definite niche for itself in the transit field is demonstrated by the existence of 648 in operation in this country, where there were practically none whatever until 1927. Great Britain alone has more than a thousand of these electric coaches. J. P. Mackinnon reported to the International Union of Tramways, Light Railways and Public Motor Omnibuses that 874 of them in 1934 operated 24,659,381 vehicle-miles over 313 miles of route, carried 227,083,825 passengers and consumed 48,199,009 kw.-hr. That is at the rate of 55,000 kw.-hr. per year per vehicle (somewhat lower than our experience). The Continent had similar stories to tell. We are just beginning to catch up in this program of giving the riding public what it likes for public vehicles.

San Francisco finds electric coaches have superior maneuverability

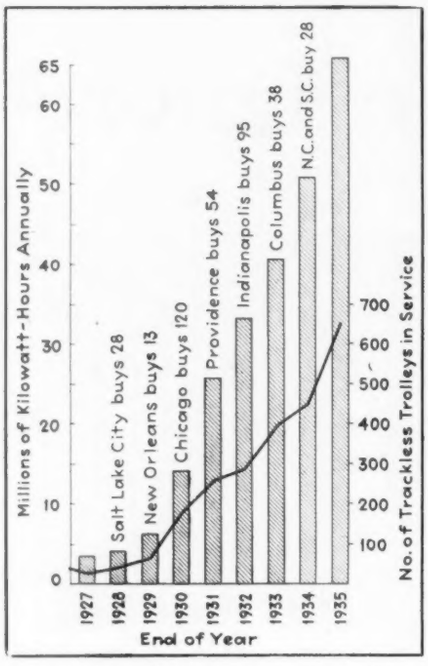
Market Street Railway gets 35-40 per cent increase in revenue. Grades up to 12 per cent encountered on 9.86-mile round trip route with one rise of 431 ft. in a 1.6-mile long grade. Turn radius of 33-ft. negotiates the extremely sharp hairpin turn at the top of this grade. Dynamic braking limits the speed to 6 m.p.h. on the steepest (12 per cent) grade. Each 19,000-lb., 37-passenger coach has two 65-hp., 600-volt d.c. motors geared for a 37-m.p.h. free running speed at full voltage. All built by J. G. Brill Company; half-powered by General Electric and half by Westinghouse. Trolley hardware is Ohio Brass.

Repaving in Columbus no obstacle to uninterrupted trackless trolley service

Of course the trolley-on-rubber is not the sole answer to all traffic ills. Several experts unite, however, in the consensus that the modernized rail car is the way out where traffic is heavy and headways are short, along with a fixed charge on track and roadway that constitutes a relatively small portion of the total cost of delivering transportation service. But where traffic has declined to the point where it will not support proportionately heavy fixed charges on capital invested in rail operation, the trackless trolley steps in to render superior service, especially if the headway is of the order of ten or even up to fifteen minutes at rush hours and even to thirty minutes at other times. It conserves some 20 per cent of the already invested capital, and what it adds is in large measure of the reclaimable type. It confirms franchises and carries an atmosphere of permanence lacking in fuel bus service. Those, apart from gratifying public acceptance, are the factors which have induced transit companies to give favorable consideration to their introduction.

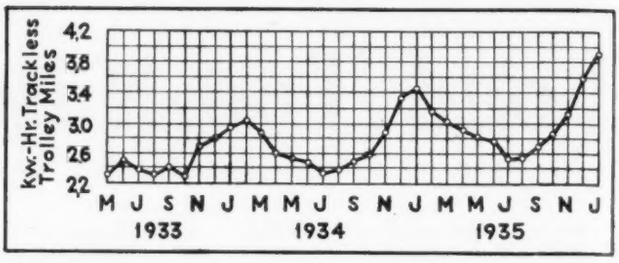
Patronage invariably rises

Public acceptance is a fact attested by such typical results as those obtained in Indianapolis, where the railway started by buying fifteen 40-passenger trackless trolleys and revamping 11 miles of overhead line (installing 450 new steel poles) at an



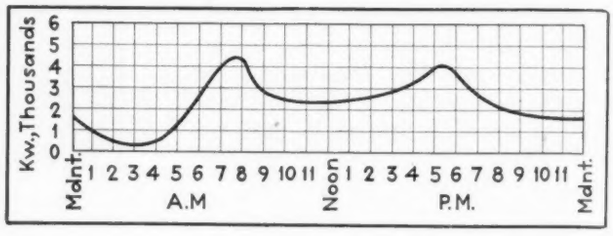
Today's trackless trolleys are using 65,000,000 kw.-hr.

Operating data show unit consumption has upward trend due to more frequent stops and starts with steady increase in patronage. A fleet of these vehicles uses about as much energy as all the homes that face its route.



Forty-passenger trackless trolley takes about 2.8 kw.-hr. per bus-mile

Typical daily load curve reflects favorable characteristics for an important division



outlay of approximately $75,000. There were also bought 25 new rail cars and 30 metropolitan-type motor coaches. Response all around was immediate and sustained. The new gasoline buses experienced a 6 per cent increase in riding over the preceding rail car operation. The new rail cars had a 10 per cent increase. But the trackless trolleys showed a 25 per cent increase. That was in 1932 and the experience has been sustained since.

Those results prompted the decision to retain rail operation on the major heavy traffic routes and to adopt the trackless trolley for all but the light traffic routes, new extensions and cross-town service. Indianapolis Railways is now operating 95 of these trolleyed vehicles. Thirteen more rail routes were converted to railless operation, calling for the setting of 2,300 new steel poles to reinforce the heavier overhead at a total outlay in this instance of some $430,000 for the 44 route-miles. The trackless trolley routes earned a gross of 18.97 per cent more in 1934 than those routes did with rail operation in 1933. The four lines that still ran with rail cars dropped off 1.96 per cent.

Riding revenue in Columbus, Ohio, increased 32.3 per cent during the first eleven months after conversions (December, 1933), while the unconverted system increased only 13.5 per cent. The whole fleet of purchased coaches had to be put in service immediately at half the expected headway in order to handle the traffic. All the gain was held and a further increase of 3 per cent experienced in the following year. Eighteen more 40-passenger buses were instituted on a second route in May, 1935, and now 18 per cent of the Columbus operations are by railless trolley.

These increases in riding revenue are not extraordinary. In fact, they have been exceeded in the experience of Public Service Co-ordinated Transport (New Jersey). The *Transit Journal* for February states that for the first seven weeks (September 8 to October 26, 1935) of the new all-service trolley-gas vehicles on one line the riding was approximately 45 per cent above that which the line experienced under rail operation during the same period of the previous year. October showed an even better enhancement. Another line showed a 24 per cent betterment. In his recent A.I.E.E. paper (March), Martin Schreiber, general manager in charge of plant, said that a gasoline-mechanical bus would require a 250-hp. engine to duplicate the performance of the 100-hp. all-service vehicle (36 seats) in carrying full load up a 7 per cent grade at 30 miles per hour.

Peak not adverse

All this potentiality of the railless trolley for interpreting transit riding in terms of wired kilowatt-hours would stir the power purveyors to little enthusiasm unless there was a disposition of the corresponding load to be considerably more favorable than the time-honored railway load, with its distressing superimposed peak. *The load curve of trolley bus operation is different:*

1. Chicago Surface Lines (120 ve-

TRACKLESS TROLLEY

a Good Electric Load

1. Holds transportation for electricity.
2. Definite potentiality for reclaiming lost load.
3. Excellent prospect of enhanced load.
4. Transit field rapidly increasing commitment.
5. Each represents 80,000 to 120,000 kw.-hr. a year.
6. Daily load curve progressively more favorable.
7. Negligible added capital required to serve.
8. Opportunity to make transit division self-sustaining.
9. Contributes to public recognition of all-electric way.
10. Protects kindred utility stability.
11. Impending volume market stimulates electrical manufacturing load.

as a Transit Implement

1. Increased revenue from satisfied public.
2. Safer curb loading appreciated.
3. Maneuverability through traffic.
4. No blocking of traffic stream.
5. Faster schedules, quick gliding acceleration.
6. Quiet riding, superior lighting and heating.
7. No fumes, no jerking of gears.
8. Holds crosstown and feeder riding.
9. Energy cost downward, taxed fuel upward.
10. Lowered over-all operating and carrying charges.
11. Utilizes existing investment in power, substations, feeders, overhead and shops.
12. Provides permanence of service on fixed routes.

hicles). The Central Avenue line on March 25, 1935, carried 3,500 trackless trolley riders during the maximum hour, which was between 7:15 and 8:15 a.m. This was for 60 vehicles, for the heaviest direction of travel and at the heaviest loading points.

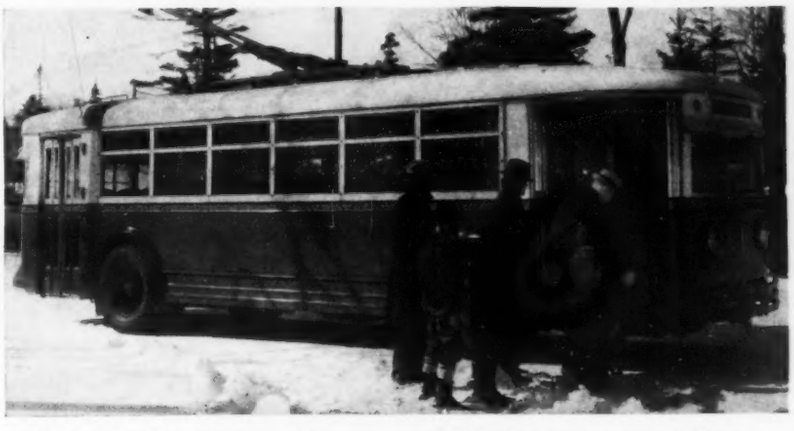
2. Dayton (19). The actual peak imposed on the power system was at 9:30 a.m. on a dark Tuesday. Normally it would occur from 5 to 5:30 p.m.

3. Kenosha (22). Transportation power load does not constitute an addition to the electric system peaks, which usually occur at 10-12 a.m. as the result of simultaneous demands of industrial loads. Transportation system peaks occur 6-8:30 a.m., 11:45 a.m.-1:30 p.m., 4 p.m., 6 p.m. Observed maximum power demand of transportation system approximately 2,000 kw. Power system peaks (15-minute demands) are on the order of 14,000 kw. Seventeen 42-passenger units handle the nominal traffic. At present operating schedules, consumption is about 2,400,000 kw.-hr. per year. The 1935 average was 2.81 kw.-hr. per trackless trolley mile. Equipment weighs only 16,000 lb.; two 35-hp. motors permanently in series on rheostatic control. Cars are heated by the accelerating and braking rheostatic losses, except for 4 kw. of heaters when required.

4. New Jersey (62 combination trolley-gas motor coaches). Volume of riding has ranged from 40 to 85 per cent higher on Sundays than on the corresponding Sundays of the previous year under rail operation.

5. Cincinnati (no trolley buses). Here with rail operation the peak has consistently fallen between 7:30 and 8 a.m. since 1932. Possibly conversion to trackless trolleys is not expected to alter this favorable characteristic.

Greenville's riders and motorists both appreciate the curb-loading of the trackless trolley



Duluth's "30 below" and heavy snowfall bring out virtue of clean, ample thermostatically controlled heat of the electric coach

Apart from the manifest appeal of the trackless trolley several factors are cited by transit operators as contributing to the improvement of the load curve. The factory and business day is, on the average, shorter now. More communities are following daylight saving. Suburban and rural schools have been closed and pupils transported to consolidation schools. Women are doing less of their shopping during the old rush hours. The movie is having its influence also in spreading the riding and diluting the rush-hour peak of the old days. Add these influences to the evident disposition to "take the trolley bus" and one discovers a load that deserves a freshened reception at the hands of the power industry.

Trackless trolley cities

The following cities have more than 750 vehicles in service or on order:

Brooklyn, N. Y.; Chicago, Ill.; Cleveland, Toledo, Columbus, Dayton, Ohio; Detroit, Mich.; Duluth, Minn.; Fitchburg, Mass; Greensboro, N. C.; Greenville, S. C.; Indianapolis, Ind.; Kenosha, Wis.; Knoxville, Memphis, Tenn.; New Orleans, La.; Pawtucket, R. I.; Peoria, Ill.; Philadelphia, Pa.; Portland, Ore.; Providence, R. I.; Rockford, Ill.; Salt Lake City, Utah; San Francisco, Cal.; St. Joseph, Mo.; Shreveport, La.; Topeka, Kan.

Transit Operator Decries the Lack of Co-operation

This article emphasizes a fact which I discovered several years ago—that both the transit industry and the power industry were neglecting the trackless trolley. I found several power companies abandoning street railway operation for gasoline buses. In one place I found the power company operating trackless trolleys and, even with the favorable operating statistics at hand, going further into gas bus operation.

I have also noticed the lack of co-operation between power companies and transit companies in endeavors to obtain municipal approval of trackless trolley operation. On the contrary, I have noticed actual indifference on the part of power companies toward the very energetic pressure put by automotive interests upon political bodies. In fact, we have received absolutely no help from power companies toward getting the vehicle properly classified as a transit tool.

Naturally my conclusion is that "our friends in power" have been overlooking a good bet. At the present time they are also making a great mistake in not placing the power rate at such a figure as to permit this load-building vehicle to be freely used and developed in the interest of the riding public.

Executive of a Transit Company.

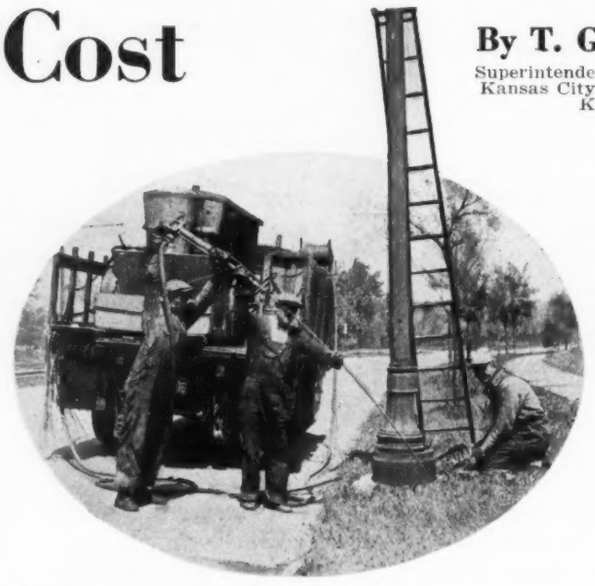
Lighting Standards Grounded at Low Cost

By T. G. HIERONYMUS
Superintendent of Underground System
Kansas City Power & Light Company,
Kansas City, Mo.

TO GUARD against the chance of accidents arising from contact with street-lighting fixtures that had become energized either through electrical failure or as the result of mechanical damage, it was considered advisable by the Kansas City Power & Light Company to ground all boulevard-type highway lighting standards. Some 4,671 of these fixtures have been grounded over a period of three years. The accompanying cost analysis (Table I) covering the grounding of 1,424 standards during 1935 gives the average total cost per fixture as $2.46 and an average total crew time of 0.27 hours, or about sixteen minutes per fixture.

All grounding was done by a crew of three men using a truck, air compressor and compressed air tools. In grounding each fixture one man removed the door at the base of the fixture and drilled a hole in the base to accommodate a Dardelet rivet-bolt. Meanwhile, the two other men drove a ground rod adjacent to the fixture in such a position that the lead wire, previously brazed to the ground rod, could be passed through the cable slot and attached to the standard with the Dardelet bolt. Before the bolt was driven home, however, the glass canopy and the lamp were removed to prevent breakage from shock while the bolt was being hammered into place.

Under favorable conditions it was found that less than a minute was required from the time the crew arrived at one standard until the grounding was completed and the crew had passed on to the next fixture. It will be noticed, however, that this figure does not compare with the average time for the 1,424 installations previously given as sixteen minutes per fixture. This average figure includes a number of cases where it was found necessary to drill through an 8-ft. limestone ledge in order to drive the rod in the soil below the rock ledge. It also covers a number of cases where the standards were located in front of buildings with the sidewalk paved to the curb. In these cases it was necessary to drill through sidewalk or street and replace the pavement.



Mass production methods applied to grounding of lighting standards

Two men drive 8-ft. ground rod with air hammer as third drills bolt hole in standard to fasten ground wire. Ladder erected to take down lamp and canopy to prevent breakage.

A separate cost analysis (Table II) covers 57 installations, made during 1934, which were more expensive than the average, due to the fact that the standards were located over areaways; that is, basements of buildings were excavated to the curb and standards set in the sidewalk, which is the roof of the areaway. In some cases where posts were sufficiently close to the curb and the sidewalk sufficiently thick it was found possible to drill through the concrete from inside of the standard, out to the street and drive the ground rod through the hole in the concrete. In other cases, it was necessary to dig a channel or trench between the post and curb, drill a hole through the pavement, drive the ground rod, install the ground wire in the trench and refinish the concrete over the wire.

It will be quite readily noticed that for this type of installation, which was not part of the 1,424 completed during 1935, but done a year previously, the

[*Continued on page 100*]

Table I—Cost Analysis for Grounding Street Light Standards

(Covers 1,424 installations)

	Total Cost	Cost per Rod	Crew-Hours per Rod	Man-Hours per Rod
Install rod	$678.28	$0.4763	0.2706	0.5412
Braze wire	109.65	0.0770	0.0802	0.0802
Truck expense	1,078.73	0.7575	0.2710	0.2710
Engr. and superv.	356.55	0.2503		
Total labor and truck	$2,223.21	$1.5611		
Total material	1,283.23	0.9011		
Total	$2,506.44	$2.4622		

Crew—Driver, cable truck and compressor at $2.79
Splicer at 1.07
Helper at 0.69

Material Used

1,424 ½-in x 8 ft. g'd rods
130 ½-in. ground clamps
554 lb. No. 6 scrap lengths copper wire
1,424 $\frac{7}{16}$-in. round washers
1,424 ⅜ x 1 $\frac{1}{16}$-in. Dardelet bolts
200 lb. Rock salt

Table II—Cost Analysis Covering Grounding of 57 Street Light Standards Located Over Areaways

Crew—Driver, cable truck and compressor at $2.79
Splicer at 1.07
Helper at 0.69

	Total Cost	Cost per Rod	Crew-Hours per Rod	Man-Hours per Rod
Install rod	$160.18	$2.8101	1.2435	3.7368
Braze wire	4.38	0.0770	0.0802	0.0802
Truck expense	228.78	4.0136	1.4385	1.4385
Engr. and superv.	14.27	0.2503		
Total labor and truck	$407.61	$7.1510		
Total material	51.36	0.9010		
Total	$458.97	$8.0520		

Cable Power Factor Greatly Improved

By G. B. SHANKLIN*

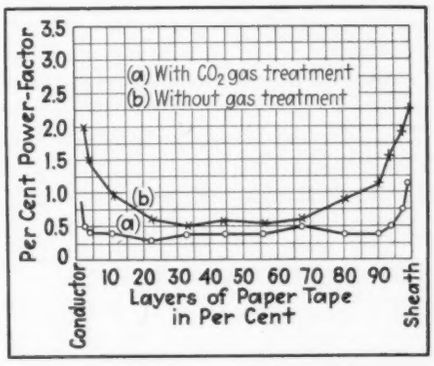
Engineer Cable Section, Central Station Department, General Electric Company

This paper briefly describes some of the benefits derived from carbon dioxide treatment during impregnation and washing of paper used in high-voltage cable. These two processes illustrate the infinite care and attention to detail necessary in producing high-voltage cable of uniform quality and stability. Plenty of high-voltage cable has been produced in the past without either of these special processes. Some, perhaps most, has proved successful and some has not. This leads to the obvious conclusion that there are other important factors in cable manufacture too numerous to deal with here. The point is that no one factor is outstanding, but they are all of equal importance.

THE fundamental principle of producing uniform insulation quality in high-voltage cable is to reduce to a practical minimum all traces of impurities that cause instability and obtain the most uniformly perfect initial impregnation possible. Specially dried and purified carbon dioxide gas has unique properties when used as a "washing" gas for removal of air (oxygen) during cable impregnation treatment. It has higher dielectric strength than air and, other things being equal, requires a higher voltage stress for ionization of voids or gas spaces. However, other things are not equal because carbon dioxide is approximately seven to ten times more soluble in oil than is air and the same quantity entrapped in the cable will be much more readily dissolved, reducing or entirely eliminating gas pockets and resulting in more uniformly perfect impregnation. An even more valuable property of carbon dioxide is its chemically inert and stable composition. There is no chemical reaction of any kind with oil. Oxygen from entrapped air is, on the other hand, harmfully active, causing gradual oxidation of impregnating oil and leading to instability and increase in cable power factor.

It is probably well known that the vacuum obtained in large commercial impregnating tanks is not perfect because of the difficulty in making such large tank areas absolutely vacuum tight. Obviously, the thing to do is remove the unknown and variable remnant air, and carbon dioxide washing proves an effective way of doing this.

After vacuum drying of the paper-wrapped, unimpregnated cable is completed the vacuum in the tank is broken by introducing carbon dioxide gas to atmospheric pressure, which is held for one hour. This, of course, thoroughly diffuses the remnant air remaining and this represents a negligible part of the total volume of gas in the chamber. A new vacuum is then quickly drawn, exhausting the carbon dioxide and remnant air down to the original vacuum. Degasified impregnating compound is then admitted, sealing the cable and preventing further exposure. One cycle of such gas washing may prove sufficient, but any number of cycles can be used as determined by results.



Effects of CO_2 gas washing treatment on radial power factor of high-voltage impregnated paper cable

The radial power factor curves in the accompanying illustration show typical results and with and without carbon dioxide gas washing treatment. It will be noted that the power factor is uniformly low through the entire wall of insulation, having only a slight up-bend near the conductor and near the lead sheath. The increase in power factor in these end zones is due to more pronounced oxidation action in proximity to the copper conductor and the lead sheath. Both metals act as catalyzers in promoting oxidation action in the impregnating oil. The almost entire absence of oxidation impurities is indicated by the low average power factor and the uniformly flat shape of this curve.

Curve (b) gives corresponding results for a cable dried and impregnated without gas washing treatment. The remnant air present caused greater oxidation and increase in power factor. There is a much more pronounced up-bend in the curve in proximity to the catalyzing conductor and sheath.

When we first adopted the gas washing treatment as a regular production routine some years ago careful test records were made of each reel length of cable in consecutive order of production, involving several thousand feet of identical cable before and after the change was made. These test records of insulation resistance measurements on each finished reel length, per

[*Continued on page 106*]

*Abstract of paper delivered before A.I.E.E., Boston, January 9, 1936.

Effects of Washing Wood Pulp Cable Paper

Type Paper	Length of Washing Time	Per Cent Power Factor, 1,000 Cycles, Dry 40 Deg. C.	60 Deg. C	80 Deg. C.	100 Deg. C.
Regular density Standard		0.272	0.211	0.172	0.172
Regular density 2 x Standard		0.335	0.253	0.213	0.203
Regular density 100 x Standard		0.300	....	....	0.200
Super-dense Standard		0.317	0.259	0.215	0.201
Super-dense 2 x Standard		0.363	0.280	0.224	0.200
Super-dense 100 x Standard		0.350	....	....	0.200

She Became a "Grunt"

When a Storm Hit Grant City, Mo., a Comparatively New Employee of the Maryville Electric Light & Power Company, a Young Lady, Hit Trouble — Here Is What She Wrote to J. H. Carson, Electric Manager at Maryville, After the Emergency:

"WHAT, no lights!" The telephone—"Electric light office, please." It was then the telephone operator informed me that we had been without current for some time and that the electric light men had left town about 6 o'clock.

I hurried to the office to take care of the calls, which, as usual, would be pouring in. This customer and that wanting to know just when they would have lights, where the trouble was, are they working on the line, etc.? Mr. Briggs had left a note stating they were starting out to locate the trouble. There wasn't much I could tell these people. "No, Mrs. Jones, the whole town is without current. Yes, the men are working on the line. No, I just can't tell you when we will have electricity." I tried to get in touch with your office, but the operator told me she was unable to get any telephone communication outside of Grant City. People were calling that wires were lying in their yards, that wires were loose from their houses, and that they would appreciate very much having it fixed before the children came home at noon. I then tried to send you a telegram, but the telegraph operator said the telegraph wires were down.

After what seemed hours of waiting, nearly praying, we had electricity at 11 o'clock. My, what a relief! Poor Mrs. Stevens called to find out if I thought the lights would stay on, now. Well, she just wanted to know if she should go over to Mrs. Black's to get her dinner, which was being cooked on her neighbor's coal range, and bring it home to finish cooking it on her electric range. Dear, dear! All I could say was, "I do hope they'll stay on, Mrs. Stevens." Just such frequent calls as these coming in the forenoon.

From 1 to 3 o'clock—more calls. Their neighbors had lights, but they had discovered a wire loose from the pole or house. One lady wanted to iron, another to sew, and one to read the daily paper. Ted Marrs, the telephone service man, came in to report several of our wires down. He seemed to think that our wires were grounding his out and wanted to know if he couldn't disconnect our wires from the poles. I told him emphatically, "No, I don't know where the primaries are and you might get hurt." He said some child might walk on them if he didn't, I still insisted he leave them alone.

Three o'clock! Briggs and Norman still gone! Of course, they couldn't telephone back here when I couldn't get communication outside of Grant City. I had heard so much about how important it was to restore current to a customer that I was really feeling the same way. I believe, by that time, I was just about as frantic as though we didn't have any current. The depot agent finally told me he could send a telegram. I sent you a telegram asking if I could get some one to help. Three-thirty—no word from you. It didn't go through. At last, a long-distance call from Mr. Elgaard requesting that Mr. Briggs repair the line to Athelstan. I told him Briggs must be on that line, but was unable to communicate with Parnell or Sheridan. Then, I asked him to give me permission to get a man here in town to put the services back. He told me that I could.

She hires a boomer

The only man in town who knew how to handle electric wires was a newcomer to Grant City, by the name of Boyd. He had told Mr. Briggs a few days before that if we had any storm trouble he would like a job. I had hired a car from the Standard Motor Company to use and had it equipped with the necessary material I thought he might need. When I gave him a list of places he was to go he informed me that he didn't know where anybody lived in Grant City. Well, it looked as though I would have to go along and show him these houses. Dressed in the boss's raincoat, a tiny hat and a pair of rubbers, if you can imagine that in a 10-inch snowstorm, we started out. The roads hadn't even been traveled on yet. When I left the office I just intended to sit in the truck and watch Mr. Boyd put the services up. The first thing I knew he had me running through the yard to bring him a wire that was lying up by the house. At that, it was better than sitting in the car freezing to death. While he was up the pole, he yelled for me to roll up the excess wire. I didn't like the idea, but he told me that was what a "Grunt" was supposed to do—so I did it. That service up! Dear Mrs. Brown could now listen to her radio.

About 7 o'clock we ran out of gasoline; clear out in the north part of town, and had to call the garage to bring us some gas. When their service man brought the gas, he had on a pair of four-buckled overshoes. I asked him if I could borrow them—that I had to be a "Grunt" and wade in snow that was knee deep. He, very graciously, loaned them to me.

On to another house. We found a pole broken off here. After clearing the wires 10 feet from the ground we went on. The next place we went the wires were broken in two in two places. This being a long service, I had to carry the wires from the house across a ditch that was drifted full of snow. In trying to get across the ditch I fell into a snowdrift. I had to get down on my hands and crawl out in order to get those big overshoes out of the snow. After the wires were strung out they were still too short to reach the pole, so it was up to me to hold the wires while Mr. Boyd spliced them. As Mr. Boyd was making his taps on the pole, he evidently got his fingers across the hot wire and the blue smoke did roll from his mouth. Then he apologized, with this statement, "Excuse me, I forgot I had a grunt wearing skirts!"

At the next place we found a 2,300-

[*Continued on page 108*]

Operations Still Rising

January Output Up 11 per Cent, Revenue 5 per Cent Over 1935 — Domestic Rate Now Under 5 Cents

WITH a production of 8,757,800,000 kw.-hr. and revenue, according to the Edison Electric Institute, of $179,140,500, January operations of light and power companies exceeded those of a year ago by 11 per cent as to the former and 5.3 per cent as to revenue. The output was the largest for any month in the history of the industry, but, as usual, income did not keep pace with the growth in kilowatt-hours and was exceeded in January of two other years, 1930 and 1931. The rise of 3.3 per cent over December income was somewhat smaller than it was a year ago.

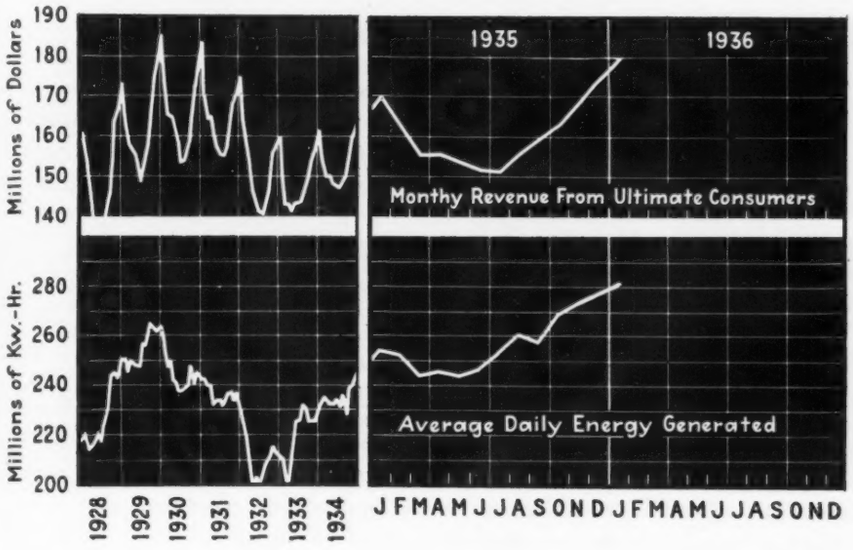


Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1936	Revenue from Ultimate Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent. Inc.
January	179,141	+5.3	8,758	+11.0	3,242	+3.3	5,516	+15. 9
1935								
December	173,459	+5.9	8,580	+13.0	3,069	+1.0	5,511	+21.0
November	169,339	+5.5	8,207	+14.0	3,055	+9.1	5,152	+17.2
October	162,789	+4.5	8,347	+12.5	2,666	+4.6	5,681	+17.0

Table II—Regional Revenue and Energy Output in January, 1936

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	179,141	+ 5.3	8,758	+11.0	3,242	+ 3.3	5,516	+15.9
New England	15,531	+ 3.1	594	+ 5.0	240	—14.1	354	+23.5
Middle Atlantic	52,356	+ 0.5	2,204	+ 9.5	587	—10.2	1,617	+19.1
East No. Central	42,223	+ 8.1	2,110	+13.2	161	—16.6	1,949	+16.3
West No. Central	15,583	+ 7.6	571	+ 4.4	148	— 6.7	423	+ 9.0
South Atlantic, East So. Central	21,872	+ 8.8	1,129	+17.0	696	+ 9.5	433	+31.3
			381	+13.6	309	+12.2	72	+20.8
West So. Central	9,439	+ 6.0	389	+20.5	20	—24.8	369	+24.5
Mountain	5,258	+11.1	286	+19.0	196	+25.2	90	+ 7.8
Pacific	16,879	+ 7.5	1,094	+14.8	885	+18.0	209	+ 3.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
†Preliminary, Edison Electric Institute.

A rise at this time is a normal feature of the annual cycle, which regularly culminates in January and then decreases rather sharply during the following four or five months. Changes must therefore be viewed in comparison with like months in the past.

Such a comparison shows that the year 1935 started with an output nearly 10 per cent ahead of 1934. Subsequent months brought smaller gains, but the earlier rate was recovered in July and in November it mounted as high as 14 per cent. The rate of increase in revenue never approached these figures. In general, it was less than half the rate for energy in any given month. The disparity brings evidence of the steady downward trend in the price of electrical energy. This is apparent also from the figures for the twelve-month period ended January 31, 1936; output increased 9.4 per cent over the preceding like period, revenue 4.6 per cent.

Rate dips under 5 cents

Domestic and retail commercial energy sales made approximately the same gains as in other recent months, barring a spurt in commercial in December: 11.4 and 12.6 per cent, respectively, over a year ago. Both rose to the highest amount ever recorded.

Another milestone has been passed in the march toward ever cheaper electric service in the home. The average rate is now under 5 cents per kilowatt-hour. The Edison Electric Institute calls attention to the fact that for the twelve-month period ended January 31, 1936, it was 4.99 cents, a decline of 5.5 per cent in a year, and is now 43 per cent below the cost in 1913.

Table III—Allocation of Energy January, 1936

Compared with Corresponding Month of Previous Year
(Edison Electric Institute)

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	8,664	+11.6
Lost in transmission, etc.	1,386	+ 7.1
Sold to ultimate consumers	7,278	+12.5
Domestic	1,467	+11.4
Com'l, small light and power	1,403	+12.6
Com'l, large light and power	3,567	+13.8
Municipal street lighting	234	+ 5.5
Railways—street, interurban	446	+ 3.5
Railroads—electrified steam	100	+49.9
Municipal and miscellaneous	61	+20.0

*Generated, purchased from other sources, imported, less energy used in railway and other departments

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

PUBLISHED EVERY SATURDAY BY
McGRAW-HILL PUBLISHING COMPANY, INC.

VOLUME 106 ESTABLISHED 1874 NUMBER 14

APRIL 11, 1936

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Only $325,000,000 for T.V.A.

FLOOD DAMAGE is an opportune moment for T.V.A. to spring a beautifully illustrated progress report on Congress asking for more money. Present obligations for six dams aggregate $181,188,525 for 882,000 kw. But T.V.A. desires authorization to build four more dams to cost $140,000,000 with 635,000 kw. If Wilson Dam is included the total bill for taxpayers will be about $365,000,000 and the total power 2,000,000 kw.

This report dramatizes the conservation of natural resources, navigation and flood control. And of course "it is the essence of conservation—that wherever it is feasible the water power should be used, and not wasted." The T.V.A. says that its studies show "an impending shortage of power of considerable magnitude in the systems of the major electric utilities that supply the market in the Southeast," therefore the Tennessee can "supply the demand for many years." At least the last part of the statement is true. And here is another big if: "If the T.V.A. plants are called upon to supply a substantial part of the new power requirements of the region the total installation at its dams to date will be readily absorbed by 1937." We challenge the conclusion that T.V.A. plants will be called upon or that power growth by 1937 will use up the already large surplus capacity on private systems.

But why go on with the further specious arguments? For example, "the right of the authority to construct transmission lines and to dispose of surplus power was sustained by the United States Supreme Court." This report is full of inference, conclusions and broad statements that will find ready Congressional acceptance if unchallenged.

Flood control in itself is contradictory to the idea of navigation and power development. Witness the floods rushing down the completely developed Monongahela, Ohio and other streams that are completely locked and dammed now. Full pools are necessary to navigation and to power. Empty pools are necessary to flood control. The two things do not go together. This latest report of T.V.A. is a sample of bureaucracy in full bloom for propaganda purposes.

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That Sugar Case Decision

ALL INDUSTRY awaited the Sugar case decision of the Supreme Court with bated breath. It was designed to clarify the anti-trust laws and to point out what a trade association might do with fair trade practice agreements. Corporation lawyers disagree in interpreting the decision. The government claims a victory.

To us the decision indicates that trade associations are valuable. They can collect full statistics and do not have to give out all of them. But trade associations cannot be a forum for price agreement or the agency to coerce members to live up to prices. The court agrees that published prices can be given, but there must be no agreement on the same prices by a group of manufacturers and there must be no coercion to make them live up to their published prices in making sales. Doubtless a complete and more competent opinion and interpretation will be had shortly when the lawyers speak.

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Study Steam Plant Ages

IS OLD AGE creeping imperceptibly into many steam-generating plants regarded as usefully modern in pre-depression days? An examination of the ages of boiler and generating units in conjunction with their service scheduling, efficiency and load developments is likely to be most revealing. Recently the ages of major quipment units in six coal-burning central stations in the Northeast were tabulated with reference to available operation. In one plant of sixty boilers sixteen were 32 years old and forty-four were of pre-war vintage; the two "youngest" steam makers were 12 years of age, and out of eleven electric generating units, seven were pre-war and the latest installation was made in 1929. Another station, built in 1925, has eight boilers, with the two newest installed six years ago, and six turbo-generators, none of which is more recent than 1929.

A smaller plant serving a city of about 100,000 has installed no boilers or generators since 1930, much of its equipment being 15 to 20 years old. In a fourth station with fourteen boilers the three latest went into service in 1922, and its five turbo-generators range in ages from 23 to 12 years. Station No. 5 installed two new boilers in 1922 and none since; its latest generating set went in 12 years ago and its oldest is now 20 years in service. The last plant studied has ten boilers installed in 1917 and generating units ranging from 1910 to 1921 in installation dates.

Each of these stations is interconnected with other systems and it is not necessary to operate the older equipment much of the year. All are important plants in urban territory, however; some are base-load installations and others are used in reserve operation, on peaks, or floating to safeguard urban supply in case of hydro interruption. It is therefore necessary to run much equipment many hours a year at fuel and water rates out of line with the best available practice, although great credit must be given to skillful administration and handling of plants for making good records under the conditions. In exceptional cases, indeed, some of the plant equipment is performing so well that there appears no direct relation between apparatus age and station efficiency; but after all, time is on the side of the designer and builder of the more modern installations.

Obsolescence approaches; loads grow steadily and engineering departments are showing new signs of life. Analysis of specific cases may show the wisdom of continuing to use certain plants and their subdivisions along present lines for a period to come, but the tide of demand is rising and must not be allowed to take the plant operator unawares. "How reliable and how efficient are our generating facilities in relation to the business immediately ahead?" is a question which presses for answer in dozens of power areas as the utility industry buckles down to the tasks of the current year.

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To Buy or Use Reconditioned?

BY THE time this issue of ELECTRICAL WORLD reaches the reader emergency measures will have restored normal power service over most of the recently flooded areas. Apparatus will have been cleaned, dried, tested and in many cases reconditioned or replaced by new units or parts. The visitation has been too severe, however, to justify relaxation of vigilance on the part of operating engineers, and field testing of equipment has never had a greater opportunity to prove its usefulness as a means of preventing failures. Under pressure to restore service after unprecedented interruptions, the temptation has been powerful to patch up old plants, both in utility and industrial circles.

However necessary this policy has been in the past three weeks, it is now incumbent upon management to study afresh the fitness and adequacy of stressed equipment and systems from the standpoint of replacing apparatus of uncertain future value with units of a modern type.

Engineers will do well to examine more critically the caliber of equipment already reconditioned, the thoroughness of the restoration processes adopted, the insulating characteristics of oil circuit breakers, cable, generators, motors, transformers and other apparatus subjected to unholy baptism, and to record adequate notes and conclusions before these become lost to memory. Too many improvements in design and manufacture have been achieved lately to justify a *laissez-faire* attitude toward modernizing plant.

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Are You For or Against Better Highway Lighting?

A CERTAIN metropolitan city has an active automobile club. The head man recently became impressed with the importance of highway lighting, for the prevention of night accidents. He wanted to help the surrounding power companies build up public opinion and get county support for several demonstration sections. This would be the first step toward state appropriations.

He went to the largest of the several utilities. He asked for assistance in developing data on accidents in this territory. No help. He asked for rate information. No co-operation. He laboriously dug the information out of the published rate schedules and the police records, for himself, amazed at this attitude.

He went to the officials of another utility and asked them if they would survey the accident history of the primary highways in their area. They replied that they did not sell highway lighting, merely took orders from the County Board, would put in 40 or 600 candlepower lamps as directed. They were not interested in demonstrations.

The automobile club man quit in disgust. If he asked the cement people for help on a program to improve road surfacing or some other project, he said, they would come and camp in his office until no further aid was needed. They are interested in anything that will build more market for cement. But the power people, it seemed to him, could only talk of rate structures and object to change. They were not interested in a new market for highway lighting.

So this automobile club, one of the strongest in the country, turned its energies to other work. There were other ways to serve the motoring public, where it is not necessary to overcome inertia or resistance on the part of people whose co-operation was expected in their own self-interest. It now looks as though nothing would be done for some time in this important region where traffic fatalities have been heavy.

Public opinion in America is rising rapidly in demand for protection against death in traffic. Something is going to be done about it. And as more and more people realize that darkness takes the heaviest toll and highway lighting could have saved 5,000 lives last year, the power companies will be accused of negligence. By public franchise they have been made responsible for lighting. Right or wrong, they will be held in part accountable. It is good public policy, therefore, as well as good business, to see what can be done. As a good citizen and for the safety of their families, utility executives should be leading in this movement.

Behind the Roosevelt Make-Up

WHAT does Roosevelt really want? Where does he want to go? What is really his ideal as to the sort of economic régime that should be perpetuated in this country?

Actually, the answers to these questions are very clear —emphatically stated in Roosevelt's own words, or demonstrated by his actions, or both. Yet there is probably more misinformation about them abroad in the land than on any other one given subject.

The answer to the misinformation is also clear. It is because in appraising Roosevelt's economic dream one must consider *only* the words and acts of Franklin D. Roosevelt himself. For if there is a single solitary adviser or lieutenant in the New Deal entourage who agrees 100 per cent with Roosevelt's economic philosophy and where it would take us this writer does not know his name.

Two widely separated groups agree perfectly on where it would take us. These are the extreme radical group of his advisers, and the most reactionary of the Tory group in business. They agree that the Roosevelt policies, carried to their logical conclusion, lead straight to state socialism, in the old-fashioned conception of the phrase. Literally with the government owning and operating everything, and everybody working for the government.

The radicals like the prospect. The Tories are horrified by it.

But Roosevelt does not agree with the prophecy at all. He believes that the capitalistic system can and will be preserved by his economic plans. He believes, further, that any "reactionary" modification of his plans would result in revolution, which would wreck, at least temporarily, the capitalistic system.

HE THINKS that it is merely blind greed which keeps so many capitalists and business men from agreeing with the necessity for pursuing his course.

Here is his economic creed:

1. Very small profits.
2. No speculative profits of any kind.
3. Drastic government supervision of private business, as to profits, working conditions, hours of labor, wages and competitive conditions.
4. Strict government control over expansions of present plants or the setting up of new plants.
5. Government ownership of all utilities except railroads. (Why the one exception he has never explained).
6. Spending of at least half a billion a year to "remake face of nature."
7. Heavy taxation on rich, intended ultimately to eliminate big fortunes.

All of which, he is confident, would eliminate both depressions and booms. There would be no good years, no bad years, employment always for every one wanting to work, and a standard of living for all as much higher than the average of today's as that of America is above that of Russia now.

Incidentally, this explains what so many business men cannot understand—why the President is so determined to impose a tax system which would prevent the accumulation of surpluses by corporations. As the President envisions the future, with his economic scheme working, there won't be any rainy days. So a "surplus," from his point of view, is just so much money withdrawn from all useful purposes.

Indeed, it is worse, he thinks. For frequently a surplus is used to create additional plant capacity which is not only not necessary, but calculated to throw that whole industry into difficulties.

THAT IS why Mr. Roosevelt believes so strongly that the government must have the power to say to any particular industry that it *must not* increase its plant capacity. It is the most important phase of his "planned economy" idea.

These economic ideas are not, as some suspect, new thoughts to Mr. Roosevelt. He has entertained them since some time prior to his ever meeting Professor Tugwell, for instance. In fact, he stated them when of all those who later were to form the Brain Trust the only one advising him was Professor Moley, who has now apparently "reformed," if one is to judge by recent editorials in *Today*, notably that one attacking the President's latest tax program.

Proof of this is readily available. It is contained in a few paragraphs in Mr. Roosevelt's speech of acceptance, before the Chicago convention, at the outset of the 1932 presidential campaign. Paragraphs which for one reason or another never received anything like the attention they deserved. Perhaps because they were regarded as mere demagoguery!

But consider them:

"In the years before 1929 we know that this country had completed a vast cycle of building and inflation; for ten years we expanded on the theory of repairing the wastes of the war, but actually expanding far beyond that, and also far beyond our natural and normal growth. Enormous corporate surpluses piled up—the most stupendous in history. Where, under the spell of delirious speculation, did those surpluses go? Let's talk economics that the figures prove and that we can understand. Why, they went chiefly in two directions: First, into new and unnecessary plants which *now stand stark and idle*, and, secondly, into the call money market of Wall Street."

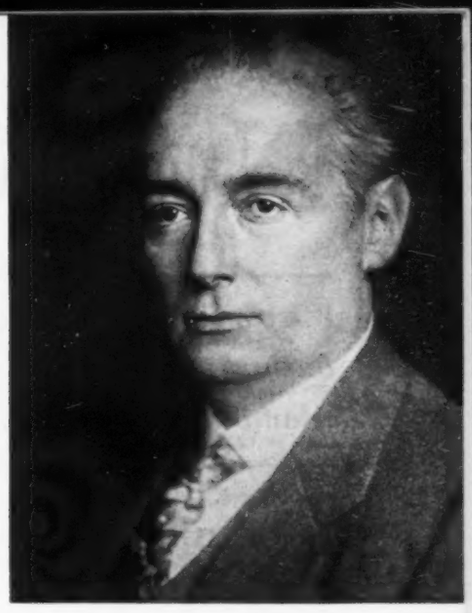
The italicized words give the key to the thought, but note also the whole idea is an attack on "corporate surpluses piled up."

Roosevelt was aiming at legislation which would not only prevent the swindling of the investor by fraud, but which would prevent losses caused by permitting him to be sold securities to finance new plants which might "stand stark and idle" because there was no demand for their product.

And the government was to determine whether the plants would probably "stand stark and idle" or not.

Do not forget that the President tried very hard, through NRA, to put this phase of his general scheme into effect. Gen. Hugh Johnson, with the approval of

—By CARTER FIELD



This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him.

the President, issued mandates along that line in the lumber and cotton-spinning industries. No new sawmills could be erected, ran the edict, until the demand for lumber should prove that the product of the new mills could be absorbed without dislocating the industry. The same with cotton mills.

An objective, by the way, very appealing to many trade associations and "combinations in restraint of trade," but frowned on heavily by the government even now, as interfering with free competition and tending to hold up prices!

INCIDENTALLY, it is rather queer that the words of Roosevelt quoted above were not given more attention. The surprising point is that this was during a political campaign, when one's political opponents might be expected to pounce on any bad mistake. Yet in the last sentence quoted Mr. Roosevelt showed an amazing ignorance, to put it mildly, of the operations of the "call market" he denounced. For he intimated that part of these corporation surpluses were lost in the call market. Whereas it is a simple fact that no corporation nor person ever lost a penny in the call market. There is just no way of doing it!

Perhaps because the Republicans were afraid to be put in the position of defending the stock market, however, Roosevelt was never publicly attacked during that campaign on this astounding error. If so, the attack was so feeble, or so little publicized, that it never reached the ears of his rather alert publicity staff.

But let's examine a few other sentences from that same acceptance speech, always remembering that it was made in early July, 1932, before Roosevelt had met Dr. Tugwell.

"During that time there was little or no drop in the prices the consumer had to pay, although these same figures proved that the cost of production fell very greatly; corporate profit resulting from this period was enormous; at the same time little of that profit was devoted to the reduction of prices. The consumer was forgotten. Very little of it went into increased wages; the worker was forgotten, and by no means an adequate proportion was even paid out in dividends—the stockholder was forgotten. And, incidentally, very little of it was taken by taxation to the beneficent government of those years."

Isn't the shadow of the coming event clearly shown, three and a half years ahead of time, of the President's present drive against piled up surpluses, of his effort to force distribution of dividends, and of heavier taxation by a government that is not "beneficent"?

In fact, the most amazing question of all is why the country realized so little of what were Roosevelt's objectives at that time. Yet even when Mr. Roosevelt interpolated a hint of his ideas about the Supreme Court, in his Baltimore speech, there was just a mild flurry. James M. Beck delivered a ponderous attack, and everybody promptly forgot all about it.

But Roosevelt hasn't forgotten any of it. He has never really given up on *any* of his objectives. NRA is not dead. It is only sleeping. The Roosevelt hope to change the Constitution so as to give the federal goverment more power over *all business and working conditions* is not abandoned. It is pigeonholed, waiting for an appropriate time. It will be resurrected just as soon as the President believes it is opportune to do so.

Roosevelt does not easily concede defeat when any of his cherished ideas are knocked down. Consider his battle to save the death sentence for public utility holding companies. It is doubtful if *any* President ever won such a victory on Capitol Hill. He has not given up hope of any single phase of his economic program.

PROBABLY the only group of business men in the country in 1932 who were afraid of what Roosevelt might do as President was that connected with the utilities, particularly the electric and gas industries. Mr. Roosevelt had shown them some of his ideas while Governor of New York. The famous—so far as the industry is concerned—decision in the Rochester case had perturbed them. The ruling there, it may be remembered, was that the new bonds might be sold at a lower price than the Utilities Commission thought right, but the company would have to reimburse its own treasury for the difference before it could pay any dividends.

So the utility group, very ineffectively and unadroitly, opposed Roosevelt's nomination and election. *Its only accomplishment was to make him mad.* Which explains a great many things that have happened since. But at least the electric industry was intelligent enough to be alarmed, even if not intelligent enough to do anything effective about it. But it had mighty poor success in trying to win allies.

Last year the utility folks tried to get the American Telephone stockholders worried over the utility legislation. No luck. Now the telephone company is on the griddle. Some of its lobbyists evidently didn't believe their own company's ads. They telegraphed, instead of telephoning. Which is going to make some interesting reading either just before, or just after, this article is printed.

NEWS OF THE WEEK

Wisconsin elections deal stunning blow to municipal ownership advocates . . . New York business men oppose city "yardstick" plant . . . T.V.A. reported buying dam site from Aluminum Company . . . Two farm "co-ops" decide private electric service is cheapest

Milwaukee Beats Municipal Plant

City registers disfavor for socialistic Mayor's proposal in decisive fashion — Vote climaxes bitter campaign — Sheboygan crushes public ownership plan

The cause of public ownership took a sound beating in this week's elections in Wisconsin. Milwaukee's vote was decisively against municipal ownership and a similar ballot in Sheboygan was overwhelmingly in the negative.

The final count in Milwaukee was 107,888 against the proposal and 80,296 in its favor.

Milwaukee's referendum was one of the most important on the municipal ownership question in some years and it had been preceded by a bitter fight between the two camps. The proposal submitted to the voters was simply the question of whether they did or did not want to buy the electric power and light facilities of the Milwaukee Electric Railway & Light Company which lie within the city's corporate limits. No price was mentioned, no method of raising the money was suggested to scare voters away from socialistic Mayor Daniel W. Hoan's cherished municipal ownership scheme.

Committee fought plan

The victory for private ownership, climaxing years of fighting, can be credited in no small part to the militant efforts of the Electricity Users' Committee, Inc., which was formed after the Mayor succeeded in getting the proposal put on the ballot for the primary elections. With Ben G. Slater as secretary, the committee held meetings, canvassed electric customers and put out literature (one of its arguments was quoted in ELECTRICAL WORLD, March 14, page 62). It even attempted last week to gain a delay in the voting, maintaining that the question was not thoroughly understood. Mayor Hoan, meanwhile, held rallies all over the city.

The referendum was undertaken in spite of legal opinions to the effect that the plan submitted by the Mayor would be thrown out in the courts. The argument was that Milwaukee, if it attempted to take over only the stations and distribution lines within its boundaries, would seriously impair service to nearby customers who are outside the city limits, and that this probably would cause the scheme to be invalidated as contrary to the public interest. Some of the Mayor's own advisers concurred in this view, but he had been baiting the "power trust" too long to be held back by such a technicality.

The vote in Sheboygan left no doubts as to how the citizenry stands on the question. The total against municipal ownership was 7,469 and only 1,345 voted in favor of the $1,200,000 bond issue.

New York Business Men Fight City Power Plant

Nine associations join, prepare unusually comprehensive argument against LaGuardia's public ownership plan — Capital cost estimates called shy by 40 per cent, fixed charges by 39.

The struggle of New York City's Mayor Fiorello H. LaGuardia for a municipal "yardstick" plant has now progressed to the stage where the state Legislature is holding hearings on the bill which would enable construction without pledging a city's credit. And the opposition reads like a blue book of the state's industry:

The Chamber of Commerce of the State of New York, the Merchants' Association of New York, the New York Board of Trade, the Bronx Board of Trade, the Brooklyn Chamber of Commerce, the Fifth Avenue Association, the Chamber of Commerce of the Borough of Queens, the Staten Island Chamber of Commerce and the Citizens' Committee Opposed to a Municipal Power and Light Plant. A representative of these groups, George H. McCaffrey, director of research for the Merchants Association, filed a long and particularly carefully worked out brief at the state Senate's hearing.

In general, the statement declared that the LaGuardia idea couldn't succeed because of politics, that the city had underestimated the capital cost by 40 per cent and the operating costs by 39 per cent. More specifically:

"We are opposed to the establishment of municipal power plants as a matter of principle, and we are opposed to the establishment of a so-called 'yardstick plant' in New York City because the optimistic estimates of its proponents cannot be realized in fact, and the use of the term 'yardstick' is a misnomer. . . . When government enters business, politics enters too—and stays. Politics in this sense is synonymous with inefficiency and extravagance. . . . Other disadvantages are the contraction of the tax base and the enlargement of the inflexible, unprogressive bureaucracy. . . .

"Even a modern 'liberal' ought to be able to recognize the economic waste which must result from building another power plant and distributing system where they are already adequate. . . . A New Deal economist ought to be able to realize that when two such systems are competing for the same customers the mere presence of a competitor reduces the ability of either to expand, to reduce its rates, to make a profit and even to pay taxes. . . .

Defend public regulation

"The best method of control is by vigorous public regulation. For we are among those who deny most emphatically the glib assertion that public regulation has failed. . . .

"New York City, with its own sorry record of incompetence, corruption, profligacy and downright dumbness in governmental as well as business affairs, is hardly in a position to pick up a pebble to throw at its electric utility companies, let alone demand the right to dump some

forty-five to sixty-five more millions of dollars into a totally unnecessary lighting plant after its subway, market and ferry failures. . . . The history of our municipal business ventures is full of glowing predictions, drab performances and unending deficits saddled glibly off onto the general taxpayer."

The statement produced figures to show that the capital cost estimate should have included $1,100,000 or more for administrative and legal expenses; that the cost of general property (administrative, operating and accounting offices, commercial and display rooms, storage space, automotive equipment, repair shops and necessary equipment for all of them) should have been put at $3,000,000 instead of $1,000,000; challenged the idea that the change-over from d.c. to a.c. can be financed by the customer without wiping out the yardstick benefits, that it can be handled by advances from some unnamed fairy godmother, or that it can be done by the municipal plant without spending $15,000,000 instead of the $2,000,000 provided; insisted that the city plant would need at least $1,000,000 working capital which is not provided in estimates as well as $2,750,000 for training personnel and securing business, and that the addition of these items totaling $19,850,000 would necessitate another $600,000 for interest during construction, a total of $20,450,000. Interest, depreciation and amortization at 4, 1.7 and 2.5 per cent. respectively (the Mayor's own figures), would be $8,066,000, an increase of 29.5 per cent, on the revised capital outlay of $65,450,000 which the statement contends is necessary.

The statement doubts that the city can get all the customers it counts on or that their use of energy will soar immediately upon lowering rates, characterizing the city's offer as the following:

"If you are now using $10 worth of electricity per month, we will sell you the same amount for $6—and here is the catch—provided you will buy twice as much as you do now. To be sure, your monthly bill will be $12 and if you don't get enough 'kick' out of letting your lights burn all night to use up to that amount of cheap city 'juice,' why, you can use some of *your* money to buy more electrical equipment."

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T.V.A. Planning Another Big Dam

Deal reported closed with Aluminum Company for the latter's site at Fontana, N. C. — Thirty-four towns in western Tennessee unite to seek T.V.A. power

Still another T.V.A. giant dam looms as an imminent probability. Reports have been current for some time that the authority had concluded a deal for the Aluminum Company of America's site at Fontana, N. C., on the Little Tennessee River, and these now can be practically confirmed in Washington. The story is that the Aluminum Company would buy whatever power it needs for its manufacturing in that area (after using the energy from its present two plants) from T.V.A.

The authority is expected to ask Congress shortly for the money to carry out this vast project, which calls for a dam 425 ft. high—second only to Boulder in height—to store more water than any other T.V.A. dam excepting Norris. This storage on the headwaters of the Tennessee River, it is argued, would serve flood control purposes as well as regulate the flow to the advantage of both power and navigation projects on the lower reaches of the stream.

The T.V.A. is not waiting for Congressional approval of appropriations for proposed new dams (ELECTRICAL WORLD, April 4, page 3), but is going confidently ahead with preliminary work. The $42,000,000 project near Gilbertsville, Ky., is a case in point. Engineers already are drilling on farms to determine just where the firmest foundation for the dam can be found.

Distribution projects also are becoming numerous. One of the largest and most active groups is the Gibson County Electric Membership Corporation. Thirty-four cities and towns in eight west Tennessee counties recently got together and authorized this "co-op" to act for them. Since then several other towns have joined the movement and Martin has asked the corporation to start negotiations with Kentucky-Tennessee Light & Power looking toward the town taking over the utility's distribution system. Plans also have been completed for a T.V.A. survey of Dyer County and committees appointed to form the organization which will deal with the authority in the purchase and distribution of power. Weakley County residents have taken preliminary steps toward forming a similar organization.

Acme

OUT GOES BONNEVILLE COFFERDAM

General view of the Bonneville hydro-electric and navigation project on the Columbia River from the air (above) and (left) the two-ton dynamite blast which recently demolished two sections of the upstream, rock-filled cofferdam which for the last year has protected the work on half of the main spilling dam. At the left in the upper illustration the structure extending from the island half way to the Oregon shore is the substructure of the power house.

Norris' M.V.A. Opposed by Dern

Secretary of War criticises delegation of so much authority to one agency — Many new power projects blossom and old ones ask for more money

Utilities this week derived a ray of hope from a War Department attack on Senator George W. Norris' vast Mississippi Valley Authority plan, even though the air still is full of a multitude of other projects which want federal money. The opposition to M.V.A. was revealed in a letter from Secretary of War George H. Dern to the Senate agriculture committee, which is holding hearings on the Norris project.

Said the Secretary of War, in what smacks of official Administration criticism: Too much authority is delegated to a single independent agency which is to function in a far-flung area. War Department opposition was followed by complaints from the Federal Power Commission and the Department of Agriculture, as well, both declaring that their authority would be infringed. The utility industry, too, had a word, with Charles W. Kellogg of Engineers Public Service classifying the project as even more destructive than T.V.A.

But, even if growing opposition should defeat or postpone the Norris measure, there are plenty of other projects ready to step in and take its place. For example, the El Paso (Texas) Utilities Ownership League is circulating petitions in the upper Rio Grande Valley urging that a hydro-electric plant be installed at Elephant Butte Dam in connection with the construction of the Caballo Dam. Moreover, Representative David Terry, Arkansas Democrat, has introduced a bill calling for thirteen reservoirs on the Arkansas and White rivers—estimated cost, $126,719,000.

There is the certainty, too, that widespread action on flood control will be sought as a result of the March inundations, and this will involve incidental power production. Thus it is that the National Resources Committee makes a statement in which it says that it will direct a "National Water Plan" report to the President before December 1. This will cover flood control, domestic uses, pollution, irrigation and power, and drainage.

With all this new construction hanging fire, it is not unnatural that some of the projects under way should drop from sight, but they are having their growing pains. Directors of the Loup River Public Power District in Nebraska, for instance, want an additional $8,326,000 of federal funds. About $1,000,000 would be for desilting plants. When the project was getting started the silt problem was broached by engineers, but Washington said: "Build the plant." Appropriations so far are $7,400,000 and about $7,000,000 more would be used to build transmission lines. This matter of transmission lines looms large at the moment, too, because the Nebraska Railway Commission has approved the first big hook-up—about 300 miles of lines to link the three P.W.A. projects which constitute the "Little T.V.A."

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Milwaukee Electric Offers Free Energy

Another spring offer of "free electricity" is being made by Milwaukee Electric Railway & Light. This time customers who elect to use twice as much energy as in the like 1935 month may have the additional power for an added payment of only 10 per cent. If more than double the amount used a year ago is taken the balance will be billed at 2 cents per kilowatt-hour.

This will be the third year that some such spring offer has been made, the policy having been inaugurated in 1934 (ELECTRICAL WORLD, April 7, 1934, page 523).

Federal Lawyers Rap Utility Tests

Accuse companies of trying to muddle courts with their attacks on the holding company law — Three new suits filed against P.W.A. loans to cities

Charges that public utility lawyers are trying to muddle the records and conceal the real constitutional issues comprise the latest effort of government counsel to avert a test of the Public Utility Act of 1935 in any but their own "hand-picked" Electric Bond & Share test.

These assertions were contained in a brief answering the appeal by North American and American Water Works from the stay granted the government in these companies' test cases pending before the District of Columbia Supreme Court. The two utilities assert, in effect, that the government is attempting to confine its test to a single case and one which is not representative. Thus both parties are contending much the same thing about each other.

The federal brief asserts that the "holding companies played their own hands high, expecting to outwit the government" in the American States Public Service test, which the United States Su-

The Current Drift

A Depreciation Problem

When the New York Public Service Commission this week urged public utilities to build up their reserves for depreciation to protect stockholders' interests, a question inevitably arises as to the board's sincerity. "Reserves" for depreciation have long been a bone of contention with regulatory authorities, although it is fairly well established that they should not be deducted from the rate base.

In this instance the situation is further complicated by New York state's fight for a "continuing depreciation" account to aid in deciding valuations for rate-making purposes. If companies follow the commission's strongly worded "advice," and if the continuing depreciation device is enforced, will not the commission's next step be to insist that these depreciation reserves be deducted from fixed capital records?

Another point: The commission cites instances of low depreciation reserves in contrast to relatively high surpluses. A company with a low depreciation reserve may quite conceivably be in the best of condition by reason of the fact that it has reinvested that reserve in the property. Conversely, a company with a large reserve may be run down in spots because it has been building the fund up and saving the money, awaiting, perhaps, some new engineering development before rehabilitating.

Fish for the Faithful

Some of these federally financed power projects are to have more allure than low electric rates, flood control, etc. Out in Nebraska the latest is the promise that the Sutherland irrigation and power project ($10,000,000) will be a sportsman's paradise. The lakes and canals will be stocked with 2,000,000 pike and other game fish, according to E. C. Kelso, secretary of the state Chamber of Commerce.

It Can't Go on Forever

Achievement note: The New York City Board of Taxes and Assessments reports that its greatest accomplishment in 1935 was adding $203,000,000 to utility assessments, thereby gaining about $5,000,000 in tax collections.

The report doesn't say it in so many words, but the board has found out what fun it is and is planning to do the same thing over again in 1936. Three experts would get $161,533 to conduct necessary studies. Some day the boys will awake to the realization that the utilities are allowed, pending the revolution, to earn a reasonable return on their investment.

preme Court declined to consider on appeal (ELECTRICAL WORLD, April 4, page 3). "The judicial process was to be used not to protect their (the utilities') constitutional rights, but to confuse and confound the government in its defense of the constitutional rights of the Congress."

In addition to holding company law litigation, the government also has a new group of P.W.A. loan attacks on its hands in the District Supreme Court. Illinois Light & Power has sought an injunction against an allocation of $420,000 to Jacksonville, Ill., for the construction of a municipal power plant; Tennessee Electric Power has filed a suit against a loan and grant of $6,000,000 to the city of Chattanooga, Tenn., and Memphis Power & Light is seeking to enjoin a loan and grant of $10,000,000 to the city of Memphis (the last-named suit is directed against both P.W.A. and T.V.A.). Temporary restraining orders have been issued in all three cases.

•

Dominion Government Upholds Power Act

Application of the Beauharnois and associated companies for disallowance of the Power Commission Act, 1935, has been refused by the Dominion Government, Premier Hepburn disclosed in Toronto last week. That the Dominion's Department of Justice would keep hands off was predicted in ELECTRICAL WORLD (February 8, page 4, and March 14, page 62). Under the terms of the act, the Ontario Legislature canceled power contracts made by the Ontario Hydro-Electric Power Commission with four Quebec companies.

The committee of the Privy Council has had the petition of the power companies under consideration for some time. Its refusal to disallow the bill was based on the report of Ernest Lapointe, Minister of Justice, who "recommended that the act be not disallowed, but that it be left to such operation as may be lawfully given to it." The committee concurred in this recommendation.

"Under the British North America Act the Dominion Government has power to disallow provincial legislation, but it would have been an extraordinary use of that power, quite out of line with local self-government, if Ottawa had disallowed the Power Commission Act," said Attorney-General Roebuck of Ontario.

Some $185,000,000 will be removed from the Ontario debt statistics by a new arrangement for financing construction work of the Ontario Hydro Commission, according to its annual report submitted by T. Stewart Lyon, chairman.

Private Service Cheaper, Two Rural "Co-ops" Find

Farmers throw in with Wisconsin Gas & Electric's new plan for extensions, asserting it is more economical than R.E.A. terms — Cooke backs long-term R.E.A. bill at House hearing

Two rural co-operatives in Wisconsin have given up the idea of building their own lines with R.E.A. money and have signed up with Wisconsin Gas & Electric Company, which plans immediate extensions costing about $300,000 to serve about 1,050 farm customers. The larger co-operative, that in Jefferson County with 1,000 members, announced that it could not buy power and amortize an R.E.A. loan as cheaply as it could get the service under the private utility's terms. The other "co-op" is that in Walworth County with 50 members.

Wisconsin Gas & Electric proposes to extend lines and provide service on a minimum bill of $4 (80 kw.-hr.) per month for three years. R. E. Moody, vice-president, declares the company is willing to invest in its territory enough money in the next four years to bring electrical service to every farm customer who wants it without any cash contribution for cost of new lines. The company is planning extensions in Washington, Racine and Kenosha counties, as well as in Walworth and Jefferson.

Prospects that the $420,000,000 ten-year R.E.A. bill passed by the Senate might never come up for final vote at this session of Congress have been modified in the last few days. First of all, most observers now hold that the tax tangle will hold Congress beyond the tentative May 1 deadline, and, with this additional time available, it is felt that a vote on the long-term R.E.A. is likely. Little chance is seen of its losing. Morris L. Cooke, R.E.A. administrator, appeared before the House interstate commerce committee recently to urge its approval, and, incidentally, put in a plug for federal subsidy in less densely settled areas. He asserted that loans so far have been self-liquidating but that the whole job cannot be done on this basis.

R.E.A. has put its final stamp of approval on the $142,250 Tide Water Power Company (Wilmington, N. C.) loan. This project previously had received tentative approval and involves 128 miles of line to serve approximately 1,000 farm customers in Carteret, Columbus, Craven, Duplin, Greene, Lenoir, Onslow, Pamlico, Pender and Sampson counties.

The authority also has approved loans totaling $121,300 for two projects to construct about 120 miles of lines and serve about 400 farms. One is the village of Sumner, Iowa, which gets $79,300 to extend its lines 79.3 miles and give service to 250 farm customers in Bremer, Fayette and Chickasaw counties. The other loan is $42,000 for the city of Mascoutah, Ill., which will build 40 miles of lines and serve 165 customers in adjacent rural territory.

These authorizations bring total R.E.A. loans to date up to $8,265,912 for 7,600 miles of lines and about 28,000 farm customers will be served when all these projects have been completed, the authority announces.

Other news on rural electrification follows:

ARKANSAS—Arkansas Power & Light has started work on its $16,000 rural extension along the Pine Bluff-Little Rock highway, to serve 140 customers, and plans new lines from Western Grove to Marshall and from Urbana to Lawson.

MASSACHUSETTS — Western Massachusetts Electric plans between 10 and 12 miles of rural extensions this year to reach Bernardston, Colerain, Conway, Deerfield and Chesterfield.

MISSISSIPPI—Bill introduced in the Legislature to set up a state rural electrification commission of three members to supervise farm-line plans and organize power districts. Co-operation with T.V.A. is the primary objective.

NEBRASKA — While rural co-operatives in eastern Nebraska are held up because their territories overlap, Iowa-Nebraska Light & Power is seeking state approval for 150 miles of line, declaring, however, that the application has no connection with the dispute over territory.

OHIO—Some 350 Greene County farmers (C. W. Mott, Jamestown, chairman) have signed up for an R.E.A. loan application.

VIRGINIA—Virginia power companies will be compelled to extend rural lines whenever five or more persons seeking service can prove that a reasonable return can be secured on the investment, under a new law passed by the General Assembly.

•

Lobby Committee May Dissolve Soon

Termination of the Senate's inquiry into lobbying is expected in the near future due to passage by both the House and Senate of bills requiring the registration of lobbyists (the bills now go to joint conference to iron out differences between the upper and lower houses of Congress). While Senator Hugo L. Black's committee (the Black-guard committee in Hearst newspapers) has said nothing about dropping everything but its fight against injunction suits challenging its "fishing expedition," Con-

gressional observers believe passage of the lobbyist registration bill cleans up its work.

In the meantime, the Senate resolution to give the Black committee $10,000 to fight injunctions against seizure of telegrams is facing stiff opposition in the House. The resolution asks the right to pay lawyers more than the prescribed scale of $3,600 a year. These lawyers would contest suits filed by Publisher Hearst and the Chicago law firm of Winston, Strawn & Shaw.

•

Larger Reserves Urged on Utilities

Public utilities in New York State this week were warned by the Public Service Commission to set up adequate reserves for depreciation in a statement which declared that stockholders' interests are endangered by the policy of some companies which carry large amounts to surplus.

The statement cites an example of an unnamed company with fixed capital "said to have cost over $15,000,000" which reported depreciation reserves of $2,500 and surplus of $4,000,000 at the end of 1934. "This book surplus," the commission declares, "does not represent true divisible earnings, because it has been built up without making adequate provision for depreciation."

•

Giant Log and Ice Jam Menaces Power Plant

A jam of ice and logs 14 miles long recently threatened seriously the largest hydro-electric plant in Canada's maritime provinces—the Grand Falls, N. B., station of International Paper. It is estimated that there were a million logs, as well as giant cakes of ice, in the jam, which necessitated a special guard on the power dam for several days. The company was able, however, finally to clear the jam without major damage.

•

Boston Edison Stock Sale

The unsubscribed balance—4,766 capital shares—of the issue recently offered to stockholders by Edison Electric Illuminating of Boston is to be auctioned today by R. L. Day & Company.

•

Massachusetts Rebuffs Special Commission

Massachusetts' Department of Public Utilities, regarded by many as a model rate-making commission, was sharply criticised by the special commission which recently submitted its report on Bay State rates. Last week the Legislature's committee on power and light turned the tables when it voted to refer the special commission's sliding-scale rate proposal to none other than the D.P.U.

•

Wallis and Daniels Head New Boston Edison Bureau

Load-building activities of the Boston Edison Company have been consolidated by the formation of a commercial bureau headed by Louis R. Wallis, superintendent of the sales department since 1910, and with Julius Daniels as assistant head. The initial step toward co-ordinating the company's work in this field was taken last year when the promotion and appliance merchandising activities were combined. Under the new set-up electrical energy and steam sales are now included with promotional work and appliance merchandising. Mr. Daniels has been head of the promotional and appliance merchandising activities of the company for some months.

COMING MEETINGS

Midwest Power Engineering Conference—Chicago, Ill., April 20-24. G. E. Pfisterer, secretary, 308 West Washington Street, Chicago, Ill.

Association of Iron and Steel Electrical Engineers—Spring engineering conference, Youngstown, Ohio, April 22-23. Brent Wiley, managing director, Empire Building, Pittsburgh, Pa.

Electrochemical Society—Spring meeting, Cincinnati, Ohio, April 22-25. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Missouri Association of Public Utilities—Annual meeting, St. Louis, Mo., April 29-May 1. Jesse Blythe, assistant secretary, Merchants Bank Building, 101 West High Street, Jefferson City, Mo.

Southeastern Electric Exchange—Annual conference, Fort Sumter Hotel, Charleston, S. C., April 30-May 1. J. W. Talley, executive secretary, 308 Haas-Howell Building, Atlanta, Ga.

National Electrical Wholesalers Association—Annual convention. The Homestead, Hot Springs, Va., May 4-9. E. Donald Tolles, managing director, 165 Broadway, New York.

American Institute of Electrical Engineers—North Eastern District Meeting, New Haven, Conn., May 6-8; summer convention, Huntington Hotel, Pasadena, Calif., June 22-26. H. H. Henline, national secretary, 33 West 39th Street, New York.

Refrigerating Machinery Association—Spring meeting, Hot Springs, Va., May 14-16. D. Norris Benedict, president, 915 Southern Building, Washington, D. C.

Air Conditioning Manufacturers' Association—Annual meeting, Hot Springs, Va., May 16. P. A. McKittrick, president, 915 Southern Building, Washington, D. C.

National Electrical Manufacturers Association—Spring meeting, The Homestead, Hot Springs, Va., May 17-21. W. J. Donald, managing director, 155 East 44th Street, New York.

Edison Electric Institute—Annual convention, Municipal Auditorium, St. Louis, Mo., June 1-4. Bernard F. Weadock, managing director, 420 Lexington Avenue, New York, N. Y.

Europe to Support Power Conference

Dr. Harlow S. Person, managing director of the Taylor Society, has just returned from an extensive European trip in the interest of the Third World Power Conference, to be held in Washington September 7-12, 1936. While abroad he conferred with national committees in thirteen countries and attended meetings in some eighteen cities. Dr. Person reports general approval of the proposed program, and particular interest in the series of "study tours" to be conducted both before and after the meetings.

Itineraries for these tours are being worked out to conform with the expressed wishes of foreign delegates. They will be planned on a functional basis to permit inspection of notable developments in various fields, such as hydro-electric power development, steam plants, coal production and utilization, electrical distribution and others. In all, there will be about nine such subjects covered in four or five separate tours. A feature of each will be the use of at least one day for a round-table discussion led by experts capable of interpreting what has been seen.

As a result of his trip Dr. Person predicts that European participation in the coming conference will exceed previous expectations.

Similar trips in behalf of the conference are being made by Dr. Roscoe R. Hill, chief of the classification section, National Archives, who is visiting the capitals of all South American countries, and Dr. Charles K. Ludewig, of the Pan-American Union, in Mexico and Central America.

Cities visited by Dr. Person included London, Paris, Rome, Milan, Geneva, Berne, Zurich, Vienna, Prague, Berlin, Warsaw, Stockholm, Oslo, Copenhagen, The Hague and Brussels.

•

Electrochemical Society to Hold 69th Meeting

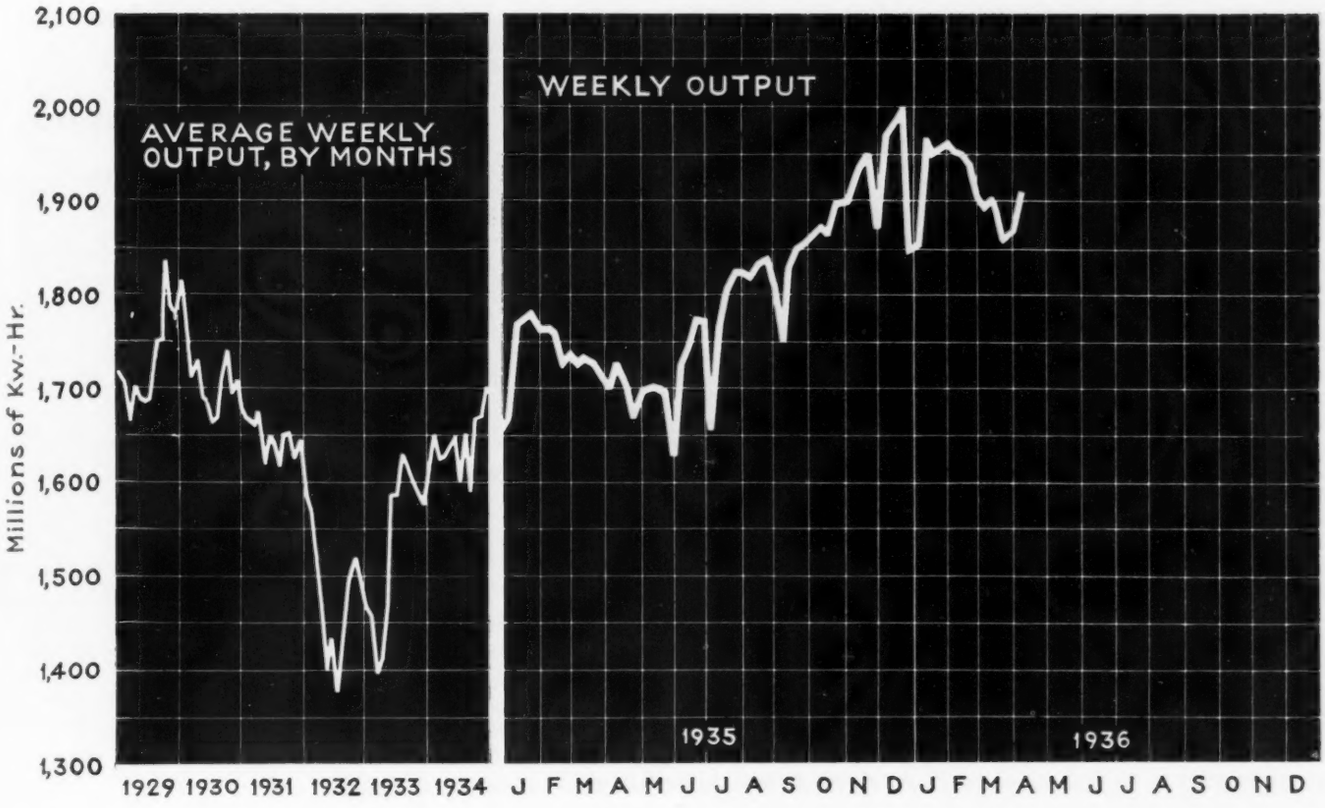
Seven nations will participate when the Electrochemical Society holds its 69th convention, in Cincinnati, from April 22 to 25, inclusive. Papers will be read by delegates from England, France, Austria, Germany, Spain and South Africa in addition to those from the United States. Two afternoons will be devoted to factory visits.

•

Vancouver Dinner May 6

Vancouver Electrical Association will hold its annual dinner May 6. Officers, however, may be elected at an earlier meeting.

Output Rises, Overcomes Spring Trend



More energy was generated in electric light and power plants during the week ended April 4 than in any week since the latter part of February, according to statistics announced by the Edison Electric Institute. Production rose 12.7 per cent above that of the like period in 1935 to 1,916,486,000 kw.-hr. surpassing the preceding week's output by nearly 3 per cent and overshooting the 1930 record for the corresponding week by 12.2 per cent. While a moderate upturn was to be anticipated, following the curtailment due to recent widespread floods, the amount of the rise was abnormally large and seems to point to an acceleration of industrial activity.

In New England the percentage over 1935 is about up to the former level. The low figures reported in the second half of March can be definitely ascribed to the floods. In the Middle Atlantic region the gain of 13.0 per cent is the largest in two years; in the Central industrial area the 13.7 per cent is the best since early winter. All other sections are 10 per cent or more above 1935 and are approximately holding their recent rate of increase.

Per Cent Change from Previous Year

Region	Week ended Apr. 4	Mar. 28	Mar. 21
New England.....	+ 7.2	+ 1.4	+ 2.8
Middle Atlantic...	+13.0	+10.4	+11.6
Central Industrial.	+13.6	+ 6.7	+ 7.3
West Central.....	+10.0	+11.2	+12.7
Southern States...	+12.0	+10.0	+10.1
Rocky Mountain..	+16.9	+16.2	+13.9
Pacific Coast.....	+13.1	+16.5	+13.6
United States...	+12.7	+ 9.0	+ 8.0

Weekly Output, Millions of Kw.-Hr.

1936	1935	1934
Apr. 4...1,916	Apr. 6...1,700	Apr. 7...1,617
Mar. 28...1,867	Mar. 30...1,713	Mar. 31...1,666
Mar. 21...1,862	Mar. 23...1,725	Mar. 24...1,658
Mar. 14...1,901	Mar. 16...1,728	Mar. 17...1,650
Mar. 7...1,893	Mar. 9...1,724	Mar. 10...1,647
Feb. 29...1,903	Mar. 2...1,734	Mar. 3...1,658

February Output Up 15 per Cent

Again surpassing all previous records for any given month, the output of public utility plants in February rose to 8,601,338,000 kw.-hr., a gain of 15 per cent over last year, the U. S. Geological Survey announces. Production from water power amounted to 2,919,875,000 kw.-hr., or 34 per cent of the total. This was about 2 per cent less than the amount a year ago. To make up for the decrease and meet the increase in total demand the fuel-burning plants had to supply 26 per cent more energy than a year ago. Average daily production was 0.5 per cent less than in January. This is about twice the normal change between January and February figures.

The quantities reported by the Geological Survey are not restricted to central stations for light and power, but are based on the operations of all power plants producing 10,000 kw.-hr. or more per month, generating energy for public use. This includes electric traction, public works, Bureau of Reclamation and others. The output of plants which fail to report is estimated.

Gains Over Previous Year, per Cent

	Oct.	Nov.	Dec.	Jan.	Feb.
United States.	+13	+14	+13	+11	+15
New England...	+14	+10	+ 9	+ 3	+ 9
Middle Atlantic.	+ 8	+10	+11	+ 8	+15
E. No. Central..	+18	+18	+18	+13	+14
W. No. Central.	+11	+19	+ 4	− 2	+ 7
South Atlantic..	+19	+23	+16	+20	+23
E. So. Central..	0	+ 1	+16	+ 9	+ 9
W. So. Central.	+ 9	+12	+14	+10	+15
Mountain	+22	+15	+14	+19	+17
Pacific	+12	+14	+14	+14	+18

Canadian Output Gains

Central-station output in Canada during February rose to 1,937,550,000 kw.-hr., compared with 1,803,447,000 last year, a gain of 7.4 per cent (3.7 per cent allowing for this year's extra day).

•

Indiana Plant Repaired After $50,000 Fire

Repair work has begun on the switchboard control room of the Public Service Company of Indiana plant at Edwardsport, Ind., which recently was damaged to the extent of about $50,000 by a fire attributed to defective cable. The blaze occasioned an interruption to service in southwestern Indiana of only a few minutes.

Utility Stocks Point Higher

Price movements of light and power stocks generally were higher this week. "Electrical World" index, 37.4; last week, 36.5.

Cons. Edison Sells $70,000,000 Issue

Consolidated Edison of New York's $70,000,000 financing—a major item in the system's huge refunding program—made its appearance on Thursday, when public offering was made of $35,000,000 3¼ per cent debentures, due in 1946, and $35,000,000 or 3½ per cent debentures, due in 1956. The ten-year issue was priced at 101 and the 20-year bonds at 99½. The proceeds of these issues will provide most of the funds for redeeming the $70,000,000 of 5 and 5½ per cent debentures.

Offering was made by the California Oregon Power Company of a new issue of $13,500,000 first mortgage 4 per cent bonds, due in 1966, at 97½ and accrued interest. Net proceeds from the bonds will be used, to the extent required, to redeem all of the mortgage debt of the company now outstanding to the amount of $11,975,800.

Wisconsin Gas & Electric Company has filed with the S.E.C. a registration statement, seeking authority to issue $10,500,000 of 3½ per cent first mortgage bonds, due in 1966. Proceeds will be used to redeem on June 1 first mortgage 5 per cent bonds, series A, to the amount of $9,900,000. Balance will be used for general corporate purposes.

•

Four Companies Exempt

Four power companies—Lynn Gas & Electric Company, Rockland Light & Power Company, Long Island Lighting Company and Wisconsin Power & Light Company—have been exempted from the terms of the Public Utility Act of 1935, the S.E.C. accepting their contention that they are primarily intrastate.

•

Associated Gas Ends "Option A" Deposits

Associated Gas & Electric last week wired all holders of $5,000 or more face amount of its fixed interest debentures that "option A" for exchange for a like amount of income debentures was expiring on April 7. As of April 2 about 72 per cent ($194,000,000) of debentures had been deposited for exchange.

•

Standardized Accounting Hearings Start Monday

Suggestions from state commissions on standardization of public utility accounting practices will be presented next week at hearings before the Federal Power Commission. The National Association of Railroad and Utility Commissioners already has heard the industry's views (ELECTRICAL WORLD, March 14, page 64).

•

International Hydro Tells of Ontario Contract Loss

The story of Ontario's cancellation and of new contracts signed is told by the International Hydro-Electric System in a report to debenture holders, telling them frankly that future interest payments are problematical. The company points out that its big Canadian subsidiary, Gatineau Power, has signed new contracts which mean about $2,000,000 less in gross revenues annually and cites the inability of other subsidiaries to pay dividends due to business depression, rate cuts, etc.

Cash reserves of $3,000,000 have been built up and these enabled payment of April 1 interest.

•

Reynolds President of Columbia Gas

Important changes in executive personnel of Columbia Gas & Electric Corporation were announced last week, with Philip G. Gossler taking the vacant post of chairman of the board of directors and Edward Reynolds, Jr., moving up to succeed Mr. Gossler as president. In addition, Walter C. Beckjord, vice-president and general manager, was made chairman of the executive committee and Thomas B. Gregory, formerly senior vice-president, was appointed honorary vice-president.

Mr. Reynolds has been an officer of Columbia Gas & Electric since 1922 and has been executive vice-president since 1930. Mr. Beckjord came to the company in 1934 from Koppers and will continue in general charge of operations.

The directors voted a dividend of 20 cents on the common stock, the same payment as was declared last October, but an official statement called to stockholders' attention the problems facing the utility industry and pointed out that no definite rate of dividends can properly be established at this time.

•

Indiana Refuses to End Municipal Plant Taxes

Municipal power plants in Indiana still are taxable. Local officials have been putting up a strenuous fight for two years to abolish such levies, but the special session of the state Legislature has refused to act on a bill to accomplish that purpose. Leaders in the campaign, however, promise to resume their fight at the next session, which opens in January, 1937.

•

Reorganization Approved

Reorganization of the Kentucky Public Service Company of Glasgow, Ky., has been approved in federal court in Louisville, providing the company succeeds in selling $125,000 in bonds prior to April 25.

•

Ohio Merger Proposed

Consolidation of Union Gas & Electric and Cincinnati Gas & Electric will be proposed to the latter's stockholders at their annual meeting April 17. Cincinnati Gas & Electric owns all the Union company's assets and franchises.

MANUFACTURING AND MARKETS

Sears a Jobber of Electrical Goods

Another departure in merchandising bobbed up this week to give the electrical trade something new to think about when Sears, Roebuck & Company announced that it has placed its line of electrical equipment with three independent stores in the Middle West. The big mail-order house some years ago entered the retail field through its own outlets, but this is its first appearance in the rôle of wholesaler or jobber.

The official announcement came from Earl Barber, head of Sears' stores unit, who declared the latest step is a further experiment in expansion of the business. The independent stores are given exclusive rights to the company's electrical line as well as furnaces and other heating equipment.

"If the experiment works out successfully," says Mr. Barber, "this type of sales outlet will be expanded. We have given them a franchise, and if the plan is mutually profitable other dealers will be enlisted."

•

Carrier Corporation Re-enters Home Field

Plans of the Carrier Corporation to re-enter the home air-conditioning field with a year-round heating, cooling and ventilating system were revealed at the annual meeting last week. A new portable summer cooler to air condition individual rooms also was announced.

The company reports sales and unfilled orders so far this year in excess of the like 1935 period.

•

Two Westinghouse Directors

Two new directors of Westinghouse Electric & Manufacturing were named at the annual meeting on Wednesday: Thomas I. Parkinson, president of Equitable Life Assurance, and George A. Ranney, president of the Peoples Gas Light & Coke Company.

•

Lamps at Architects' Show

Architects' co-operation in the Better Light-Better Sight movement was epitomized in the Architectural League's recent show in New York, where an entire room was devoted to an exhibition of many styles and types of approved lamps, demonstrating a variety of uses.

•

New N.E.M.A. Member

The Hevi Duty Electric Company's application for membership in the National Electrical Manufacturers Association has been unanimously approved by the executive committee.

•

M.I.T. Dean Loses Suit Over Patent Royalties

Royalty claims under an electric cable patent held by Dr. Vannevar Bush, dean of the M.I.T. engineering school, were disallowed by Common Pleas Court in Philadelphia this week. Dr. Bush had sued Philip H. Chase of Philadelphia under a contract calling for $3,000 a year, asserting that he did not receive the $1,500 for the last half of 1932. Mr. Chase contended that Dr. Bush had agreed to accept half the minimum under the agreement which expired in September of that year.

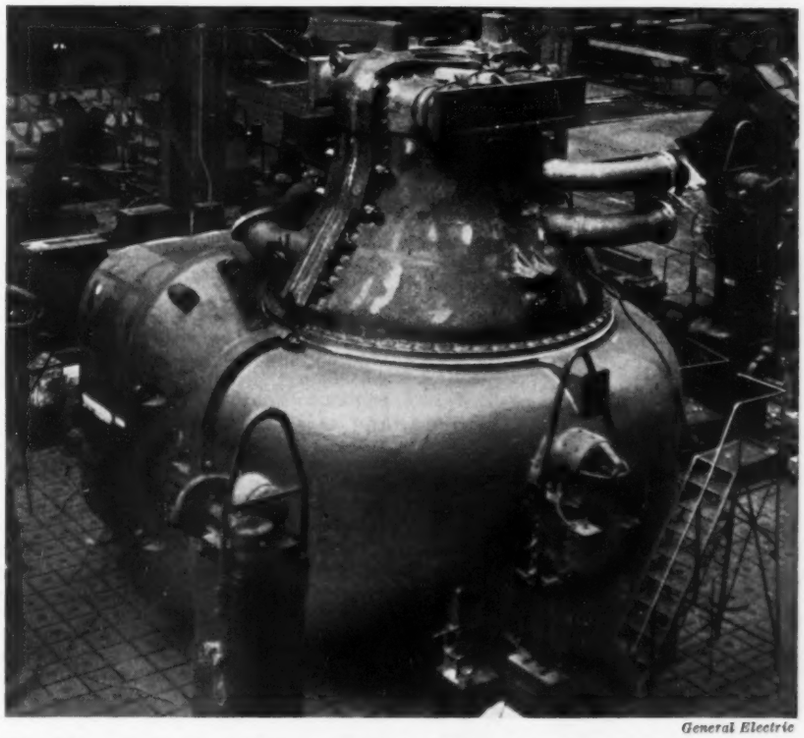
•

Welding Research Work Broadened

Organization of a new industrial subcommittee to co-ordinate industrial welding research is announced by the welding research committee of the Engineering Foundation. The new group, according to Prof. Comfort A. Adams of Harvard University, chairman of the main committee, is part of a plan for expanding the study. The subcommittee is headed by Col. C. F. Jenks, commander of the Watertown (Mass.) Arsenal, and seven divisional committees are being formed to work with him.

Professor Adams reports that some 60 investigations already are under way in universities, not to mention many researches being carried on by industrial and federal laboratories. The work of the welding committee is jointly sponsored by the American Welding Society and the American Institute of Electrical Engineers.

MORE CAPACITY FOR DETROIT EDISON



General Electric

The Conners Creek station of Detroit Edison has 180,000 kw. capacity, but when the present modernization program is completed it will have 330,000 kw. Less than a pound of coal will be required per kilowatt-hour instead of 1.4. Above is pictured an exhaust hood and shell for the first of the new 60,000-kw. turbo-generators on the floor of the General Electric plant at Schenectady.

Old Sol Outmoded in New Greenhouse

A glimpse of the future! Farming without the use of daylight or sun heat. Such is the prophetic vision in a greenhouse at the Boyce Thompson Institute for Plant Research at Yonkers, N. Y., where General Electric engineers and the Westchester Lighting Company were called in to aid in the experiment.

Artificial light from incandescent lamps, which can be controlled for desired results, has been substituted for sunlight in a large degree, and the radiant energy from the same lamps constitutes the sole artificial source of heat. The building was constructed largely of heat-insulated materials and the temperature rose on warm days, during the experiment, to such an extent that windows had to be opened. The operating cost proved comparable to that of the ordinary greenhouse heated with coal and maintenance was considerably less.

•

Toledo Air Conditioning

More air-conditioning systems were installed in Toledo last year than in all previous years combined—26 including three factories, four stores and two restaurants.

•

Hoover Expands Plant

Introduction of a new model having necessitated more space, the Hoover Company announces plans for an addition to its suction sweeper factory at North Canton, Ohio.

•

Taylor Stoker Sales

Recent purchases of Taylor stoker installations by five corporations and three public projects are reported by the American Engineering Company. Among the customers are Philadelphia Electric, Fisher Body and Chevrolet.

•

New Research Bureau

Formation of the Temperature Research Foundation, in New York, to disseminate news of the latest developments in heating, food preservation and air-conditioning fields is announced by Kelvinator.

•

Contractors Join Retailers

With pardonable pride the Kansas City Electric and Radio Association announces that the Electrical Contractors Association has taken membership in the retail group as a body.

G. E. Employees Get $35,360 for Ideas

New ideas submitted to the management netted General Electric employees $35,360 during 1935, an increase of $6,142 over 1934, the company announces. More than $500,000 has been paid for such ideas since the plan for soliciting employee suggestions was adopted by the company in 1926.

New York Metal Prices

	Apr. 1, 1936 Cents per Pound	Apr. 8, 1936 Cents per Pound
Copper electrolytic	9.25*	9.25*
Lead, Am. S. & R. price	4.60	4.60
Antimony	13.125	12.75
Nickel ingot	35.00	35.00
Zinc spot	5.275	5.275
Tin Straits	47.60	47.125
Aluminum, 99 per cent	19—21	19—21

*Delivered Connecticut Valley

Field Reports on Business

Reports to ELECTRICAL WORLD *from observers in the field indicate that the floods of late March and the destructive winds of early April have had no more than passing effect on the business upswing—that a widespread rise is now in progress. A fairly sharp gain in electric energy output at a time when the normal trend is lower, the best steel production since 1930, and optimistic reports on Easter retail trade are typical.*

CHICAGO

Business entered the second quarter of the year with optimism. Although the improvement over the previous week was scarcely noticeable, production and profit figures for the first three months of 1936 showed remarkable gains in spite of adverse weather encountered. Heavy industry is catching up rapidly. Construction in the first quarter was double that of last year. The electrical industry has forged ahead and even greater acceleration is expected.

Construction was started last week on another housing project consisting of 24 two-story homes, scheduled for October 1 occupancy. Proposals are being received on a job requiring 145,000 ft. of rubber-insulated, lead-covered cable. Bids are also requested for 600 tubular steel poles for electric line construction. An order for four 250-kva. single-phase transformers was reported.

Sales of electric appliances continue upward, with refrigerators registering nice gains over last year. Lighting equipment manufacturers report increased activity, particularly in stores and offices.

NEW ENGLAND

Buying continued steadily during the past week with no unusual orders for electrical equipment reported. The demand for small motors and switch and control apparatus is encouraging, with one manufacturer reporting a vigorous demand for fractional-horsepower motors. The volume of small motors sold during the first quarter of this year is appreciably above the volume last year. Line materials are more active and sales of wire and pole-line hardware increased during the past week. Inquiries for insulators are being received, but sales are limited to scattered replacements.

An active demand for tub transformers to replace units damaged by flood water is noted. One central station in the Connecticut Valley recently bought a new control battery to replace a flooded installation. Sales of materials used for reconditioning damaged electrical machinery are strong; wiring devices, armored cable and lamps are selling well. Residential meter orders are heavy. Contracts for schoolhouses amounting to over $500,000 were let during the past week in eastern Massachusetts, involving new lighting systems.

Merchandising, while retarded somewhat by floods, shows a 10 per cent gain over last year. Industrial conditions are such as to forecast steady buying.

PACIFIC COAST

The end of March showed a decided upturn in business, and all branches of the electrical industry once more are optimistic after the disappointing slump which followed brisk trade early in the year. The outstanding piece of business in this area is an $819,316 award for the Eagle Mountain pumping plant for the Metropolitan Water District of Los Angeles and its Colorado River aqueduct.

The Southern California range campaign shows a 40 per cent advance over last year and will be continued indefinitely. Sacramento furnished another evidence of intensive appliance campaigning, reporting a gain over 1935 of 37 per cent in refrigerator sales and 57 per cent for irons.

Residences and smaller apartments still stand out in the construction line. In the Pasadena area there are approximately 100 residences being built, ranging from $7,500 to $25,000. The U. S. Army recently allotted nearly $3,000,000 for improvements in the San Francisco area. Mining business is improving, an electrical item being pumping out of abandoned diggings.

Dealers report steadier prices after the recent conduit drop, although only about 5 per cent of the 30 per cent reduction has been recovered.

NEW YORK

Improvement in business has been unmistakable in the last two weeks, flood influences being largely forgotten excepting where they mean replacement orders. All major business indexes point in the same direction: Power production in the latest week scored a fairly sharp rise at a time when the trend usually is downward (the margin of gain over a year ago was widened to 12.7 per cent, against 9 the week before); steel output has spurted to about 65 per cent of capacity, the best in nearly six years; carloadings have recovered after flood dislocations, and Easter retail trade in the New York area seems destined to run 15 per cent ahead of a year ago.

That there is business being done in electrical lines (even if utilities have been blocked in their major expansion projects by the Washington obstructions) is clear from General Electric's first quarter orders, reported at $59,569,879, against $49,379,932 in the like 1935 period, a gain of 21 per cent.

There are trustworthy reports that the hatchet will be buried in the copper price dispute.

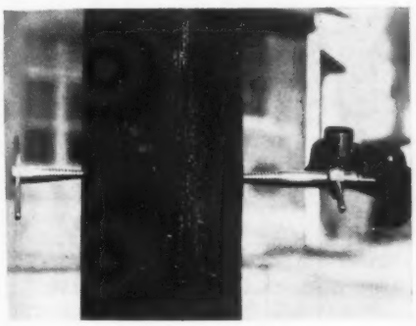
FIELD OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Injects Creosote in Pine Pole Bolt Holes

By FRANK KOONTZ
Operating Superintendent
Oklahoma Gas & Electric Company

It has been the practice of the Oklahoma Gas & Electric Company for some time to treat bolt holes in creosoted pine poles that have been drilled subsequent to the original treatment of the poles. This is for the benefit of the inner wood which was not reached by the preservative during the original treatment. The purpose is to provide protection against attacks of fungi, and consequent decay, so that the strength of the poles may be maintained and their life prolonged. Creosote oils of approved formulas are used as treating agents.



Preservative applied at 120 lb. pressure
Preservative is poured into the cup and the cylinder is filled by pulling out the handle. A spring inside the barrel pulls the plunger forward, exerting pressure on the preservative to force it into the wood cells.

When treatment of bolt holes was first started the creosote oil was applied to the inner surface by means of an ordinary swab. Later, the Greenlee bolt-hole treater was adopted. As can be seen from the illustration, the treater consists of a spring-thrust pump which is screwed into one end of the hole and a screw type plug is placed in the other end of the hole.

Although the spring exerts a moderate pressure on the plunger, which has a relatively small diameter, the resulting pressure on the treating liquid at the farthest outward position is approximately 120 lb. per square inch. Additional pressure applied to the handle will increase the liquid pressure, and for this reason a safety valve is provided to prevent damage to the timber. Ordinarily, one charge is sufficient for a treatment. Occasionally the creosote oil finds an outlet through deep weather checks or voids. In such cases more than one charge is required and the maximum pressure may not be attained.

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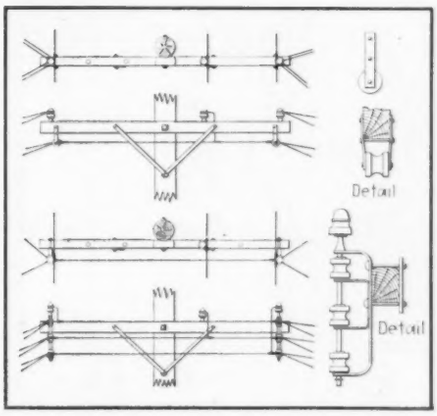
To Clear Up Service Loop Congestion

By R. A. HAMMACK
Overhead Standards Engineer,
Public Service Co. of Colorado, Denver

Where several service drops must radiate from a pole the construction shown has been found very effective in avoiding pole-top congestion. The linemen do not encounter the obstructions to climbing that would exist if the services radiated from the pole proper. They have greater freedom in making new attachments or changing old ones. They can lean back in their belts and work in safety and relative comfort. The arrangement and devices which give these advantages also minimize possibilities of crossed loops and keep them clear of other wires on the poles, such as transformer risers. Buckarms are almost unnecessary.

One method makes use of a simple neutral bus under the crossarm, strung between two secondary spool insulators, which are in turn fastened to the ends of the arm. It is desirable to have the bus under, rather than above, the arm, so that it will not interfere with a lineman who may stand on the secondary arm while working on a circuit above. This method is used mostly for two-wire loops, the bus making the neutral wire available at either side of the pole.

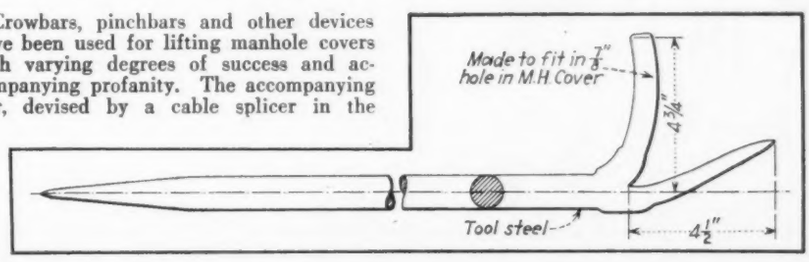


For a cleaner pole top
Neutral bus carried under cross arm or three wires stretched in front simplify service loop connections

Another arrangement consists of a three-spool bus rack with a line pin an integral part of the rack. By this method the top bus wire is on approximately the same level as the top of the crossarm, and in this position can be blanketed easily if a lineman wishes to stand on the secondary arm while working above. This construction provides for pulling two-wire and three-wire loops in any direction without fouling the climbing space on the pole and without getting into crossed loop difficulties.

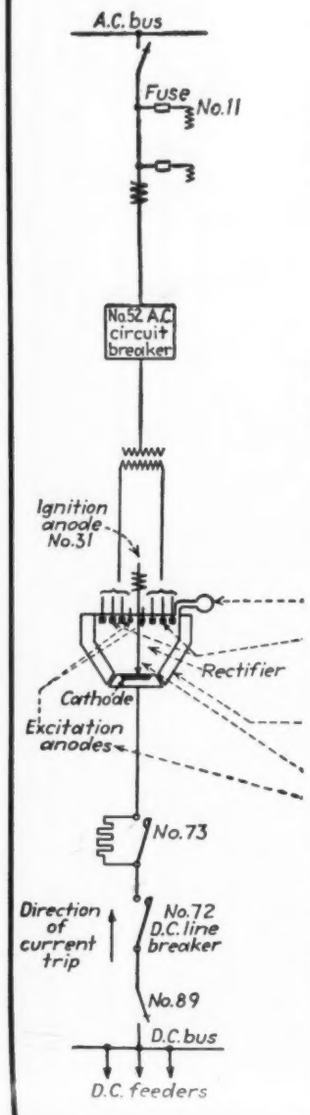
Manhole-Cover Lifter

Crowbars, pinchbars and other devices have been used for lifting manhole covers with varying degrees of success and accompanying profanity. The accompanying bar, devised by a cable splicer in the underground department, has a "rhinocerous horn" of tapering circular section that may be inserted in one of the finger holes, endowing the bar with a formidable leverage for lifting purposes, according to C. L. Abbott, underground department, Nebraska Power Company.



Automatic Control for Mercury-Arc Rectifiers

Prepared by H. Bany (General Electric Company) and M. E. Reagan (Westinghouse Electric & Manufacturing Company), joint authors of one of the papers on the "automatic stations" program of the recent A.I.E.E. winter convention. The chart shows exactly what is available to insure automatic functioning of rectifiers.



Device and Control Characteristics

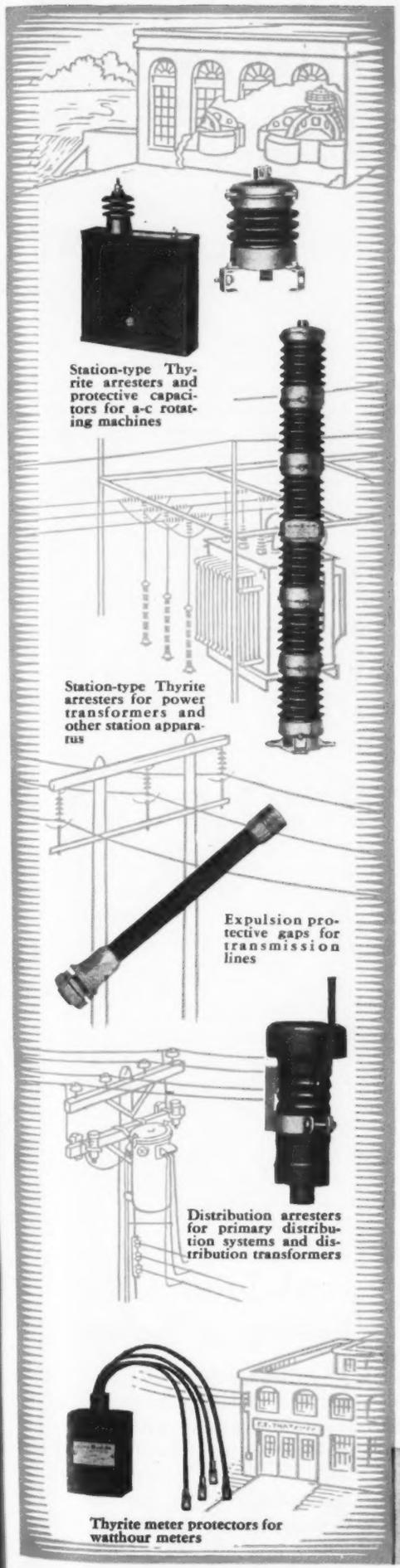
Substation	Attended	Part Time Attendance	Unattended
Disconnecting means	Manual	Manual	Manual
Control power transformers	As required for rectifier auxiliaries		As required for rectifier auxiliaries and switchgear
Current and potential transformers	As required for instruments, meters and protective relays		
Control of starting (and stopping) by	Attendant	Attendant	I Supervisory control II Load responsive a. Low D.C. voltage & time delay in single unit installation b. Overload or failure of preceding unit in multiple unit installation III Local or remote control switch IV Time switch
Closing mechanism	Manual	Manual	Electrical
Tripping mechanism	Electrical	Electrical	Electrical
Reclosing of No. 52 by	Attendant	Attendant	A.C. reclosing relay No. 79
Power transformer	—	Temperature relay equipment (See protective features)	
Tank pressure	Automatically controlled by: I Rectifier tank pressure relay II Interstage reservoir pressure relay III Continuous operation		
Anode temperature	Automatically controlled by undercurrent relay and electric heaters		
Tank temperature	Automatically controlled by thermostat, electric heaters, and temperature regulating valves as part of one of the following types of cooling systems I Open, by tap water II Closed by water to water heat exchanger III Closed by air to water heat exchanger		
Ignition and Excitation	Automatically controlled, supplied from I Three phase A.C. II Single phase A.C. III Direct current		
Load shifting resistor and resistor shunting circuit breaker	—	—	(See protective features)
Closing mechanism	Manual†	Manual†	Electrical
Tripping mechanism	Electrical	Electrical	Electrical
Reclosing of No. 72 by	Attendant	Attendant	A.C. reclosing relay No. 79
D.C. line switch	Manual	Manual	Manual
D.C. feeders	Manual reclosing	Manual or automatic reclosing	Automatic reclosing I Load indicating II Periodic

†If available; otherwise breaker with electrical closing mechanism must be used

Protective Features

Protection in case of:	Attended	Part Time Attendance	Unattended
	Obtained by:		
Low or single phase A.C. supply voltage	Attendant		A.C. Undervoltage and single phase relay No. 47 (Shut down)
Severe A.C. overcurrent	A.C. overcurrent relays No. 51 Tripping A.C. circuit breaker No. 52 and D.C. line breaker No. 72		I ←Same, followed by a definite maximum number of automatic reclosures by A.C. reclosing relay No. 79 (Lockout shut down if fault does not clear) II ←Same, using instantaneous or very inverse A.C. overcurrent relays with high current setting to operate only on severe faults (Lockout shut down)
Arc back	Reverse current tripping of D.C. circuit breaker No. 72 and tripping of A.C. circuit breaker No. 52 by A.C. overcurrent relays No. 51 or by the reverse current tripping of No. 72		←Same, followed by automatic reclosure of No. 52 and No. 72 by A.C. reclosing relay No. 79
Succession of arc backs			A.C. reclosing relay (Lockout shutdown)
Transformer overtemperature No. 49 (Continued moderate overload)	Attendant	Transformer temperature relay of one of the following types: I Resistance temperature detector relay II Replica type relay III Thermostat in top oil (Shut down)*	(Shut down)
Failure of transformer cooling medium No. 63W	(Alarm)	Air or waterflow relays (Shut down)*	(Lockout shutdown)
Too high rectifier tank temperature No. 26H	Tank thermostat (Alarm)	Tank thermostat (Shut down)*	Tank thermostat (Shut down)
Too low rectifier tank temperature No. 26C	Tank thermostat (Alarm)	Tank thermostat (Shut down)*	Tank thermostat (Shut down)
Too high rectifier tank pressure No. 63V	Vacuum relay (Alarm)	Vacuum relay (Shut down)*	Vacuum relay (Shut down)
Failure of cooling medium for rectifier or for mercury condensation pump	Either directly by waterflow relay No. 63 or indirectly by tank thermostat No. 26H and vacuum relay No. 63V		
	(Alarm)	(Shut down)*	(Shut down)
D.C. overcurrent	—	—	I One or two steps of load shifting resistance inserted on A.C. or D.C. overcurrent and short circuited on undercurrent (Shut down on overheated resistance by thermal relay No. 28)
	II D.C. overcurrent tripping of D.C. line circuit breaker No. 72	←Same with automatic load indicating reclosing	
	III	Same operation as for A.C. overcurrent	
Failure of rectifier to be connected to A.C. and D.C. system within a predetermined time	Attendant	Attendant	A.C. reclosing relay No. 79 or incomplete sequence relay No. 48 (Lockout shutdown)

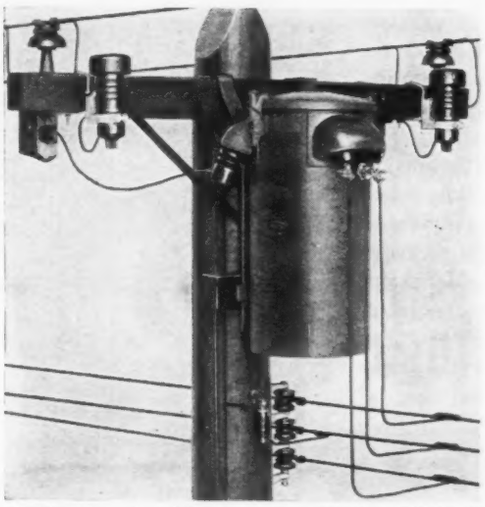
*Some or all of these may be "alarm" instead of "shut-down" if attendant is within calling distance.


Station-type Thyrite arresters and protective capacitors for a-c rotating machines
Station-type Thyrite arresters for power transformers and other station apparatus
Expulsion protective gaps for transmission lines
Distribution arresters for primary distribution systems and distribution transformers
Thyrite meter protectors for watthour meters

G-E Pellet Arresters for Distribution Systems

Lightning PROTECTION

of Proved Superiority and Economy



Installation of pellet arresters protecting 2400-volt distribution transformer. Arrester ground connected to secondary neutral through isolating gap

THE recent survey* of operating results obtained on distribution systems of 38 different electric-power companies justified this conclusion:

". . . . interconnection of lightning arrester ground with secondary neutral has been found superior to other methods of protection."

Another exacting study† of economics of service operation with and without protection justified the decision *to install arresters with all distribution transformers regardless of size.*

Since their introduction in 1923, G-E pellet arresters have continued to demonstrate unsurpassed protective efficiency, both in the laboratory and in the field. Pellet arresters—applied with interconnection—assure the utmost over-all reliability against transformer burnouts, fuse blowing, and consumer-service interruptions. They limit the lightning voltages to an extremely low value during discharge—which provides a large margin of protection against transformer-insulation failures or flashovers, and assures a longer extension of service life for apparatus.

Install pellet arresters now — protect every distribution transformer from the smallest to the largest — and realize the practical elimination of your lightning troubles and customer-service interruptions. Ask for Bulletin GEA-93J. General Electric, Schenectady, N. Y.

* A.I.E.E. paper, "Distribution Transformer Lightning Protection Practices," Jan., 1936, *Electrical Engineering.*

† A.I.E.E. paper, "Lightning Arrester Economics," Jan., 1936, *Electrical Engineering.*

COMPLETE LIGHTNING PROTECTION FROM THE GENERATOR TO THE METER 330-246

GENERAL ELECTRIC

NEW ENGINEERING IDEAS

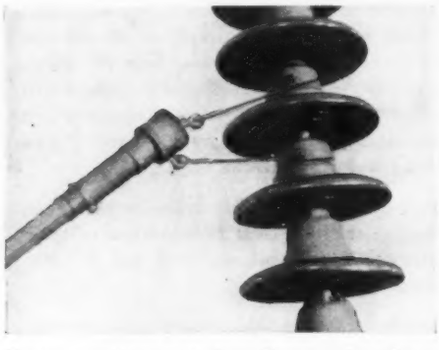
Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Electrometer Detects Faulty Insulators

By A. ELGENBERG
Civil Engineer,
Alvkarleo, Sweden

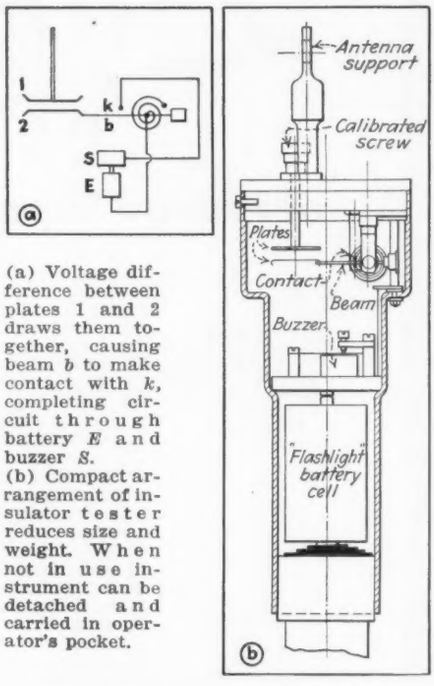
A delicate electrostatic instrument mounted with and controlling a buzzer circuit in a compact detachable case atop an insulated "hot line stick" has been developed by the author to aid in positively identifying faulty units of a string of transmission insulators while the line is in operation. The voltage sensitive element of the instrument is essentially a disk-type electrometer. It consists of two movable plates, one of which is insulated from the rest of the instrument and has its position relative to the other plate controlled by a calibrated screw. The second plate is similar to the first except that it is mounted on a carefully balanced, spring-controlled beam, parallel to and directly opposite plate one.

Two soft metal rods or "antennæ" extend from the instrument. One of each of the antennæ is electrically connected to a plate of the electrometer. When the antennæ of the instrument are placed across a "sound" or



Instrument mounted on lineman's safety "stick" gives positive indication of insulator failure

perfect insulator, as shown in the accompanying illustration, the resulting voltage difference applied across the instrument plates sets up electrostatic forces which attract the plates toward each other. The greater the distance between the plates the greater will be the voltage difference required to draw them toward each other.



(a) Voltage difference between plates 1 and 2 draws them together, causing beam *b* to make contact with *k*, completing circuit through battery *E* and buzzer *S*. (b) Compact arrangement of insulator tester reduces size and weight. When not in use instrument can be detached and carried in operator's pocket.

Insulation tester based on the electrometer principle

As the plates are drawn together an electrical contact is made at *K*, completing a buzzer circuit and producing a tone and indicating that the insulator is good.

By adjusting the position of the upper or movable plate by means of the calibrated screw it is possible to vary the distance between plates of the electrometer so that the tester will give buzzer tones for a range of voltages from 2,000 to 8,000, depending upon the allowable minimum voltage across individual insulator disks of the string under test.

Voltages that exist across sound insulator disks are generally greater than those needed to bring the instrument to activity; the indication given by the instrument is therefore distinct. In cases where an insulator is faulty no voltage difference will exist across the faulty insulator disk. Absence of the buzzer tone will therefore indicate a faulty insulator.

Faults Located With Simple Fuse Device

Fault location on British transmission lines is being facilitated by a new fuse-type fault indicator. When this device is connected between a steel or wood structure and ground so as to shunt out a section of the structure, the passage of fault currents sets up a potential difference across the unit sufficient to cause operation of its luminous indicator fuse.

In circuits without a ground wire only the locator mounted on the faulty pole will operate. Where circuits are provided with ground wires the fault current flowing to ground is greatest in the vicinity of the fault and decreases rapidly with increasing distance from the fault. Consequently the design of the locator has to be such that the locators near the fault will operate while the rest are left intact.

Examination of the apparatus after each fault can be made at ground level by applying a test battery across each locator in turn. Failure to indicate signifies that the fault has occurred at or near the structure under test. These units are made by A. Reyrolle & Company, Hebburn-on-Tyne, England, and were described in the *Electrical Review* (London). Special attention is paid to the method of connecting the indicator to the ground rod. The wire is clipped to the top of the rod above the terminal to take up tension during erection.

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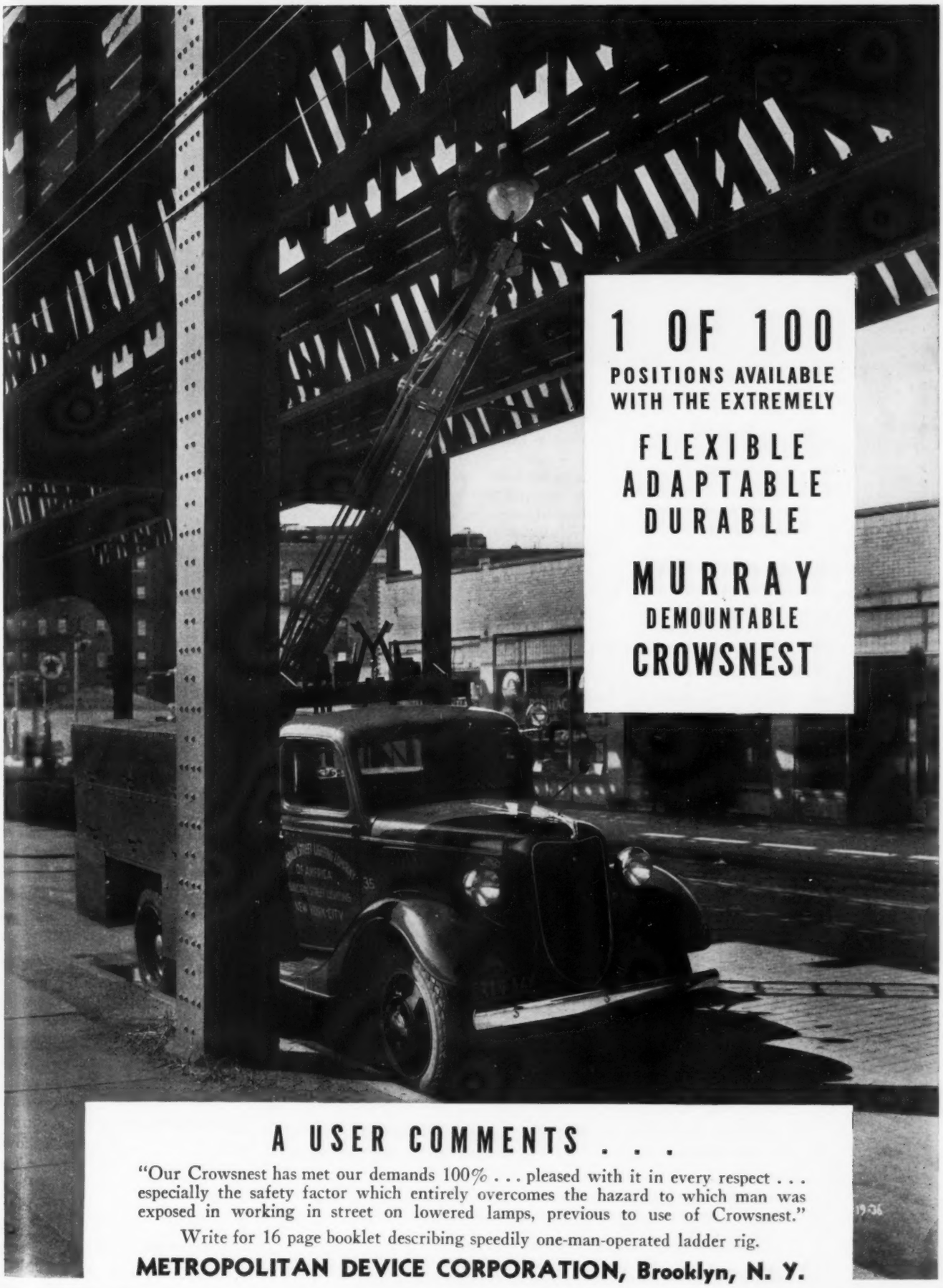
Crab-Joint Affords Fusing of Network

Supplementing the reduction of conduit and vault explosions afforded by less and less explosive types of network cables is the opportunity to segregate faults by fusing incorporated at the "crab-joint" splices (see ELECTRICAL WORLD, March 14, 1936) at the secondary network connections. Two or all four of the branches of the crab



A USER COMMENTS . . .

"Our Crowsnest has met our demands 100% . . . pleased with it in every respect . . . especially the safety factor which entirely overcomes the hazard to which man was exposed in working in street on lowered lamps, previous to use of Crowsnest."

Write for 16 page booklet describing speedily one-man-operated ladder rig.

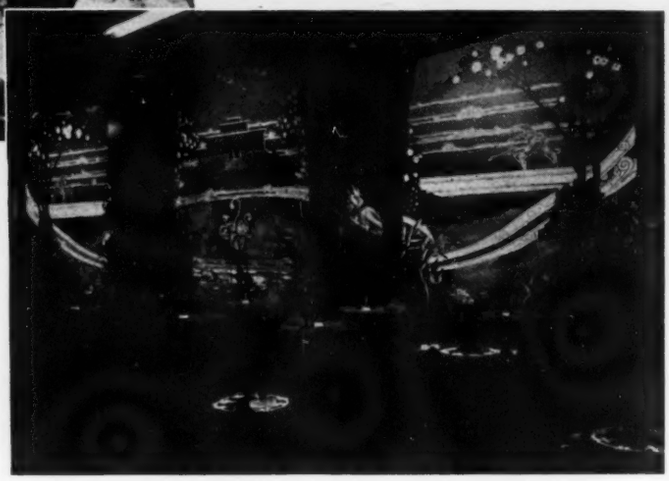
METROPOLITAN DEVICE CORPORATION, Brooklyn, N. Y.

MURRAY DEMOUNTABLE CROWSNEST

Cooper-Hewitt lighting units suspended from the ceiling furnish ultra-violet light which makes the decorations in this club become fluorescent

joint are made of No. 2 stranded copper 3 in. in length between the end of the connector of the crab and the end of the connector on the straight splice to the main section. These links provide satisfactory fuse protection for the No. 4/0 mains. They blow (see chart) at time-current values which, if exceeded; would heat conductors and adjacent insulation to point of permanent damage. The information is from a recent A.I.E.E. New York Section paper by C. P. Xenis, division engineer, distributing engineering department, of the New York Edison Company.

Aluminum offers more satisfactory fusing characteristics, but it has not been used to date because of the difficulty of making a satisfactory connection when high temperatures are involved.



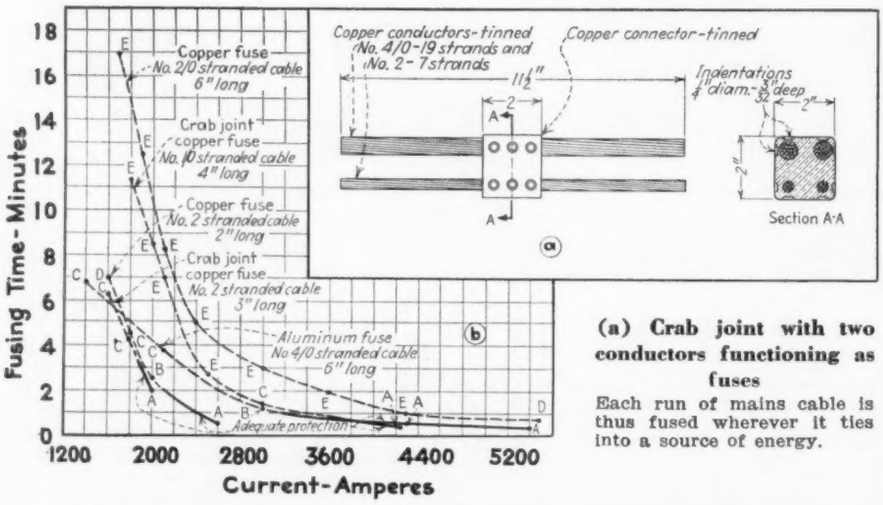
Murals of the Treauville Club taken with ultra-violet light show the brilliance of fluorescent paint under ultra-violet light. Tablecloth designs also can be seen

Fluorescent Paint Offers New Load

Lighting effects as unusual as they are beautiful have been obtained at the Treauville Club in San Francisco by employing a newly developed paint which has the property of becoming fluorescent when subjected to ultra-violet light. Murals along each side of the club which have been done in fluorescent paint appear as soft blues and tans under normal illumination, but under ultra-violet light stand out as vivid yellows and purples, giving unusual depth to the painting. Table-cloths also have been painted with a pattern of the fluorescent paint which is invisible under normal light, but which glows vividly under the short-wave illumination.

The stage show is built around the unusual effects which can be obtained by the combination of fluorescent paint and ultra-violet light. Entertainers' costumes and accoutrements, such as fans, streamers, etc., and even grease paint have been treated with the fluorescent property of the new paint, which makes a brilliant and entirely new effect from the usual dance routines.

Use of fluorescent paint for decorative purposes requires two lighting installations, one of the normal incandescent type and the other of Cooper-Hewitt lights. In the Treauville Club the ultra-violet source is composed of twelve Cooper-Hewitt lighting units made up with dark purple glass tubes. The installation of these units is shown in the accompanying illustration. The Luminous Products Company of Berkeley, Calif., manufacturer of the fluorescent paint, is experimenting with other applications, such as inks suitable for lithographing outdoor billboards, oil paint for exterior illumination and other applications where fluorescence qualities would enhance display possibilities.



(a) Crab joint with two conductors functioning as fuses

Each run of mains cable is thus fused wherever it ties into a source of energy.

(b) Burn-off characteristics of fuses for protection of secondary mains

Condition of rubber on associated No. 4/0 cable mains after blowing of fuse.

A—Little or no damage. B—Softened but not melted. C—Started to melt. D—Melted. E—Destroyed. Below 1,800 amp. the 3-in. No. 2 copper fuse fails to protect No. 4/0 insulation, but such values are comparatively rare. In normal operation (225 amp.) the fuse losses raise the crab joint temperature only 4 deg. C.

LINE CONSTRUCTION COSTS.... BUILD WITH WESTERN RED CEDAR POLES

When expansion is necessary, Western Red Cedar Poles in your power lines insure against heavy reconstruction costs. Additional bolt holes can be bored, gains cut or any other alterations made at any time after their erection, for installation of more crossarms or equipment or for joint use with telephone companies without endangering their service life.

Nature builds into the heartwood of Western Red Cedar Poles a highly toxic substance that resists decay and wood destroying insects. Only at the ground line is supplementary preservative treatment of the thin sapwood necessary. The modern Western Red Cedar Pole is good for 30 or more years of efficient service in the line.

Dry Western Red Cedar Poles possess high dielectric strength. This makes possible frequent changes or additions to power line equipment without interrupting service, and at reasonable cost.

Western Red Cedar Poles make a stable power line. Their natural taper and large treated butts result in a low center of gravity for the line and provide firm anchorage even under unfavorable soil conditions. Long spans with a minimum number of guy supports are practicable and any user of poles can profit through the use of Western Red Cedar.

Western Red Cedar Poles are a sound investment. They offer money-saving advantages not found in any other pole wood available in commercial quantities. For this reason there are so many millions of Western Red Cedar Poles in use among electric light and power companies in this country.

Build and modernize with these time-tested fine poles and get the utmost in good power-line construction.

WESTERN RED AND NORTHERN WHITE CEDAR ASSOCIATION
Metropolitan Bank Building MINNEAPOLIS, MINNESOTA

CEDAR POLES

Construction and Maintenance

POWER AT WORK IN INDUSTRY

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Suture Sterilization in Conditioned Air

To produce surgically clean sutures in large volume for operative use, the E. F. Mahady Company, Boston, recently installed a "sterile unit" on an upper floor of its building, utilizing both electric oven and air-conditioning service as aids to antisepsis. The processing of the catgut strands takes place in a series of glass-inclosed rooms or cubicles in which temperature and humidity requirements are important to successful output. Filtered air of the proper quality is supplied to these compartments by a conditioning unit housed in a separate chamber on the same floor, with provision for its suitable heating by steam coils in winter and cooling of air flow in summer to maintain about 72 deg. F. in the working spaces. The cooling equipment utilizes a York 5-ton compressor driven by a 5-hp. motor and a fan driven by a ½-hp. Holtzer-Cabot motor. A small air compressor serves the automatic system of temperature and humidity control (Johnson Service), and also supplies air to gas sealing burners used in closing the glass tubes containing the sutures. The conditioned compartments include the following rooms:

Preparation, 10 ft. x 18 ft.; processing, 8 ft. x 10 ft.; washing, 4 ft. x 8 ft.; filling, 8 ft. x 10 ft.; sealing, 10 ft. x 12 ft.; washing room with hand basin and foot valve control, 8 ft. x 8 ft.; central corridor, 8 ft. x 8 ft. All compartments are 8 ft. high. Employees are required to observe the best operating room technique in assembling, preparing, processing and storing the material. Sterile gloves and handling devices are used throughout the unit; glass partitions extending within a few inches of the tables guard the sutures against bacteria from the human breath, and the vapors from heating the solution used in the containing tubes are removed by a fan and discharged outdoors. The air supply enters the compartments through ceiling outlets and leaves through louvers near the floor level. Recirculation and outdoor supply are both available on the intake side of the conditioning outfit. Tests show an extraordinary reduction in bacteria content of the air when using conditioned air as compared with untreated outdoor air.

The sutures are sterilized in electric ovens, four being installed at present. These each are equipped with two 1,000-watt General Electric "Calrod" heaters and a complete charge of sutures can be raised from 23 to 160 deg. C. in 40 minutes. The sterilization period in the ovens lasts one hour at 160 deg. C., and the temperature is automatically maintained within 0.2 deg. C. plus or minus. Motor-driven stirrers agitate the oil baths used in the ovens to insure more even distribution of heat. The sterilizing oven shown in the accompanying illustration has recently been replaced by kettle type ovens. Another electric incubator rated at 600 watts is used in the department for bacterial culture.

Air-conditioning minimizes bacterial content of atmosphere in compartments of sterile unit manufacturing surgical sutures. Electric sterilizing oven at left center

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Electric Heat Silvers Mirrors

By H. R. STEVENSON
Detroit Edison Company,
Detroit, Mich.

One application for which electric heat seems to be especially designed is heating mirror silvering tables. Two such installations have been made in Detroit. The enterprising midget salesman will discover, when he calls on these prospects, that the classic method of heating mirror tables is by means of a water bath which is itself heated by steam coils or by gas or oil burner. In the latter case there is a distinct fire hazard that electric heat will eliminate, and in the first electric heat can usually be shown to be more economical.

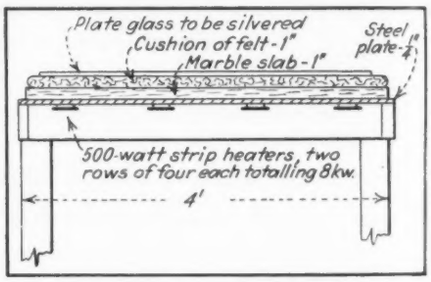
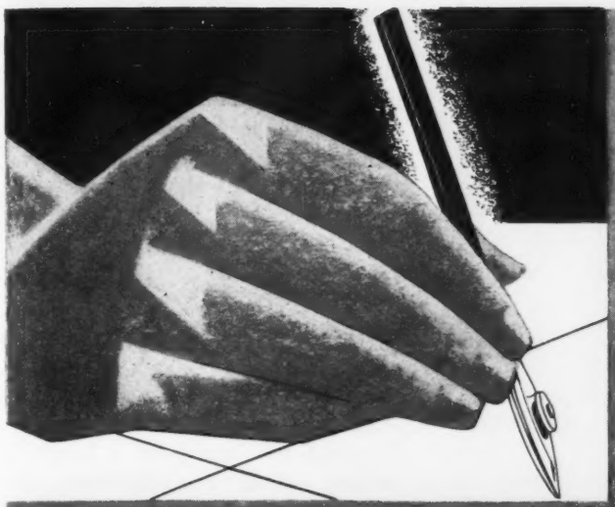
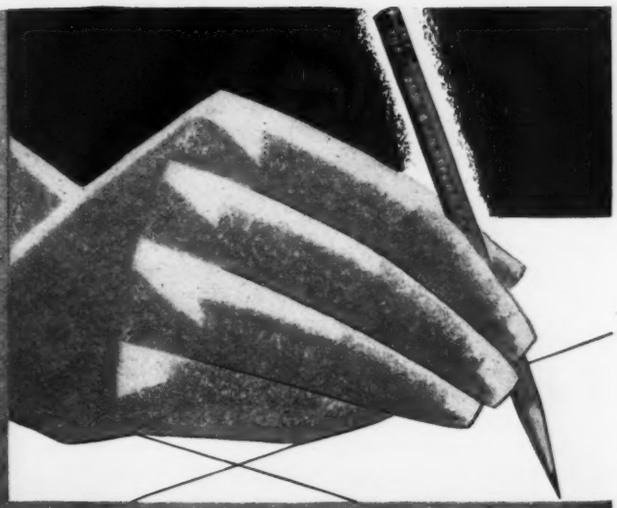


Plate glass to be silvered
Cushion of felt - 1"
Marble slab - 1"
Steel plate - ¼"
500-watt strip heaters, two rows of four each totalling 8kw.
4'

Silvering table is electrically heated

The accompanying sketch shows how strip heaters, eight of them of 500 watts each, were applied to a table about 4x6 ft. which had previously been heated by a water bath. The heaters were fastened in two rows of four to a ¼-in. steel plate on which the marble table top rests. On the marble is a cushion of 1-in. felt to absorb the excess silvering solution which is poured on the sheets of glass laid on the felt. The effect of the heat is to accelerate evaporation of the carrier and precipitation of the silver from the solution onto the glass. This is a difficult application for heat from

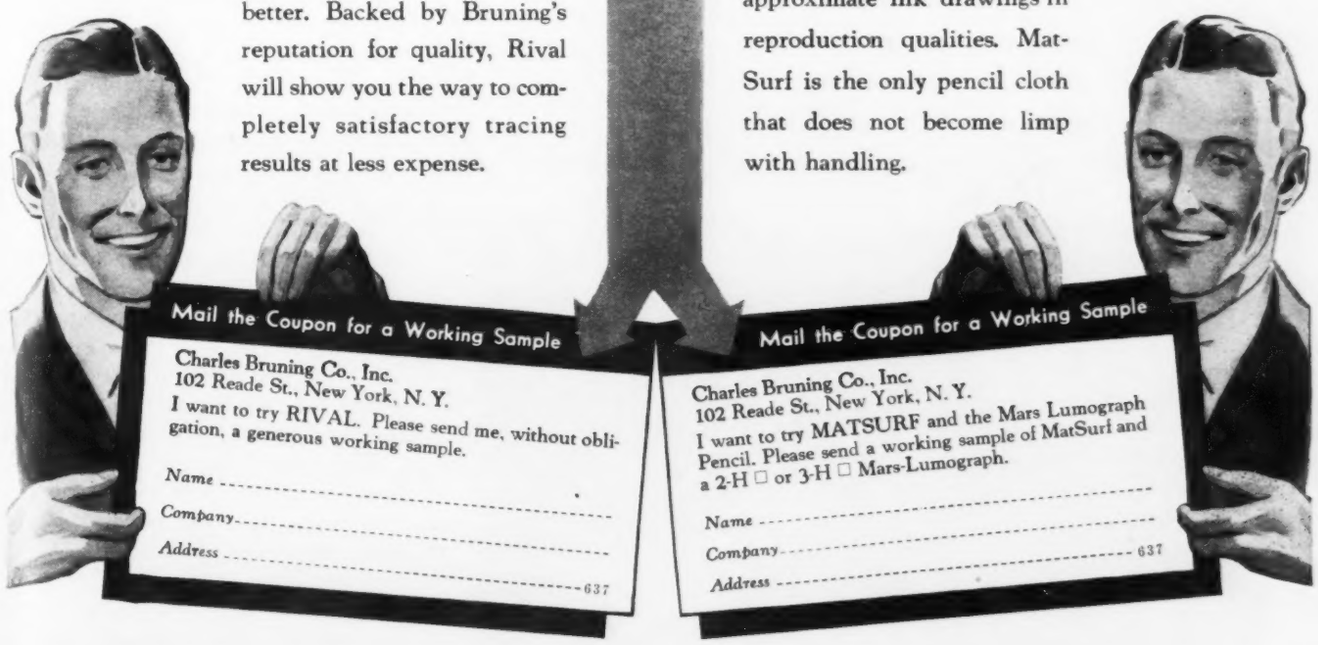




Do you know these MODERN aids to BETTER DRAFTING?

● RIVAL is an ink tracing cloth that passes the most rigid tests for uniformity of working surface . . . durability . . . transparency . . . tensile strength . . . and erasing qualities—*yet costs less per roll.* No wonder it is hailed as a "discovery" by users who have been paying higher prices for tracing cloth that is no better. Backed by Bruning's reputation for quality, Rival will show you the way to completely satisfactory tracing results at less expense.

● MATSURF is a pencil tracing cloth, blue in color, with the transparency of an ink tracing cloth but with a mat surface that takes and holds pencil graphite *permanently.* Tracings properly made on MatSurf with a 2-H or 3-H Mars Lumograph Pencil approximate ink drawings in reproduction qualities. MatSurf is the only pencil cloth that does not become limp with handling.



Mail the Coupon for a Working Sample

Charles Bruning Co., Inc.
102 Reade St., New York, N. Y.
I want to try RIVAL. Please send me, without obligation, a generous working sample.

Name _____
Company _____
Address _____ 637

Mail the Coupon for a Working Sample

Charles Bruning Co., Inc.
102 Reade St., New York, N. Y.
I want to try MATSURF and the Mars Lumograph Pencil. Please send a working sample of MatSurf and a 2-H ☐ or 3-H ☐ Mars-Lumograph.

Name _____
Company _____
Address _____ 637

BRUNING

—LEADING THE FIELD TODAY IN SENSITIZED PAPERS, REPRODUCTION PROCESSES, DRAWING MATERIAL AND DRAFTING ROOM EQUIPMENT

Since 1897

NEW YORK CHICAGO DETROIT BOSTON NEWARK ST. LOUIS PITTSBURGH LOS ANGELES SAN FRANCISCO MILWAUKEE

any source because the heat has to travel through four materials, steel, marble, felt and glass, to reach its function. And two of these materials, marble and felt, are conspicuously poor heat conductors. For this reason the capacity of electric heat to be localized is particularly valuable in this application.

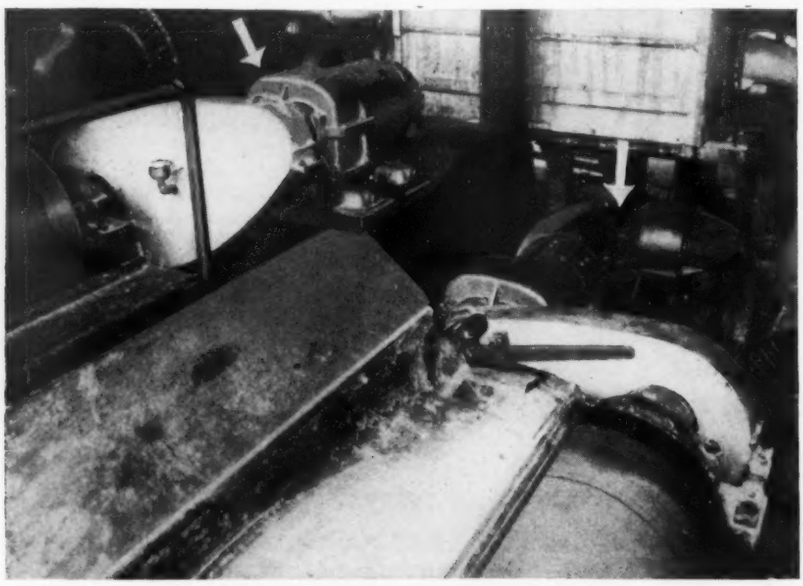
•

Auxiliary Drive for Paper Machine Rolls

Direct-current generators coupled to the lower rolls of a paper machine in a Fitchburg, Mass., paper mill are being used to supply just enough power to the upper rolls of the machine, through small gear motors, to balance bearing friction. In this way the top rolls are driven without making it necessary for the paper to transmit torque, as was formerly the case when the top roll was friction driven from the bottom roll.

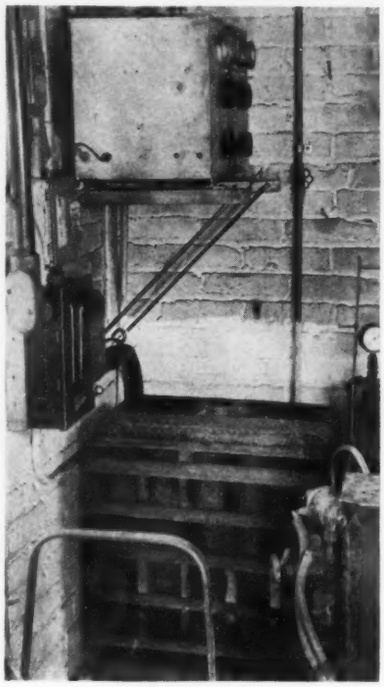
By relieving the paper of the necessity of transmitting torque the quality of the paper is improved, and because the pressure between rolls can be increased the machine can run faster, increasing production.

The generators and motors, made by Westinghouse Electric & Manufacturing Company, were so designed that the gearmotor applies constant torque to the rolls throughout the speed range. A booster generator supplies the power at the instant of starting, since at that instant the generators attached to the rolls deliver zero voltage.



Top rolls of paper machine driven by gear motors from power supplied by generator on positively driven lower roll

Electric Heat Speeds Radiator Repairs



Strip heaters speed removal of moisture from repaired radiators

Overhauled automobile radiators after being put through an "air water immersion test" are generally given a coat of paint. But the radiators must be thoroughly dried before being painted, and this drying takes time, which is valuable. Time and money-saver, therefore, is the hot-water unit heater at the Brooklyn Battery Company in Cleveland, Ohio, where the substitution of five 2,000-watt, fin-type strip heaters and a ¼-hp. motor to drive the air over the units dries the repaired radiators in five minutes, considerably less than was previously possible with the hot-water coils. Increased production at a lower net cost per radiator will shortly pay for the change-over.

•

Electric Heating Proved by Experience

The idea that electric heat treating is more expensive than other types is corrected by data from a large Los Angeles plant manufacturing tools and other special metals for oil well operations. At this plant there are two box-type electric furnaces, one 36x72x24 in. and the other 48x72x24 in., and two drawing furnaces. The box furnaces are used for normalizing, annealing and hardening the steel. No matter which combinations of furnaces are used or in which part of the furnace the heat is located, all steel produced is within two points of the same hardness and there are no rejects.

In a typical day's production the large box furnace produced 9,250 lb. of work and consumed 1,190 kw.-hr., or a rate of 0.129 kw.-hr. per pound of metal treated. This figure includes the heating of the furnace in the morning. The smaller box furnace in a similar day produced 5,925 lb. of metal with a consumption of 579 kw.-hr., including the heating-up time in the morning. This rate is but 0.098 kw.-hr. per pound of metal treated. The larger drawing furnace consumed 257 kw.-hr. in producing 2,340 lb. of metal, a rate of 0.11 kw.-hr. per pound. The smaller drawing furnace consumed only 0.057 kw.-hr. per pound of metal drawn at 1,600 deg. F. Converting these figures back to the energy rate, tests show that the total cost of electric power for the complete heat treatment is only 4.3 mills per pound.

These four electric furnaces have been in service seven years with only very minor maintenance work, yet recent tests showed that they still have a very good efficiency. Considering that most of the parts treated go through the furnaces four separate times for normalizing, annealing, hardening and drawing, the power consumption for the treatment is surprisingly low. Also on the credit side of the electric furnace is the low maintenance cost, the absence of loss from spoilage and low labor cost of attendance.

$90,000 FIRE THREATENS TO DESTROY LIGHT PLANT

Intense heat and choking fumes accompanied the burning of two transformers at the main generating plant of the local electric light company.

Although the fire occurred outside of the buildings, it appeared for a time that it might reach and de-

Protect YOUR SYSTEM— ISOLATE EQUIPMENT THAT FAILS

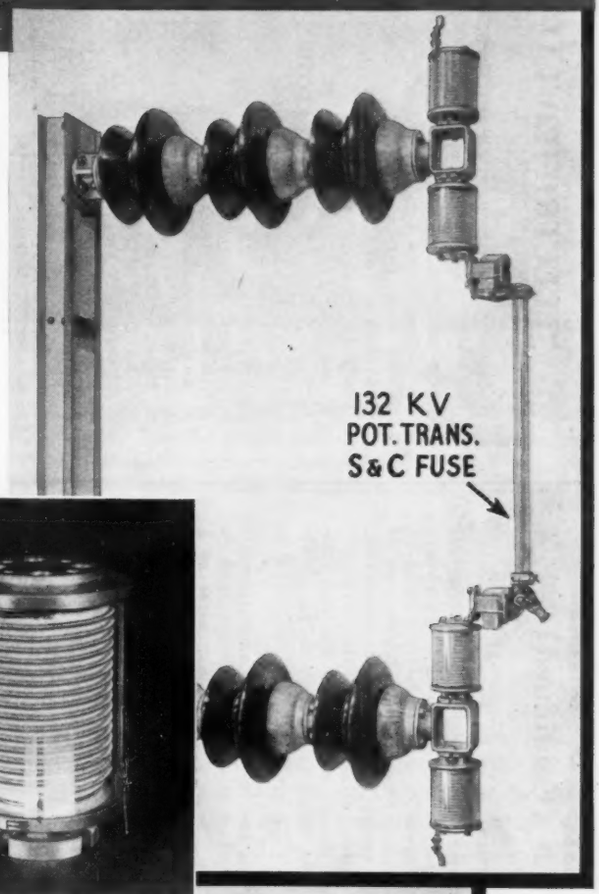
LET S&C RESISTORS ABSORB THE "BUMPS"

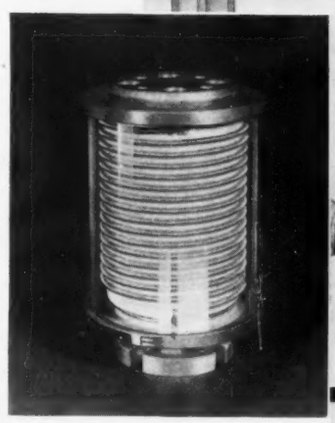
If a failure in potential transformer insulation occurs—the S & C Resistor limits the fault current to approximately 200 amperes regardless of the possible short circuit current.

The "bump" on the system is avoided—the DLC Fuse operates, isolating the potential transformer in case of primary insulation failure or in case of secondary short circuit.

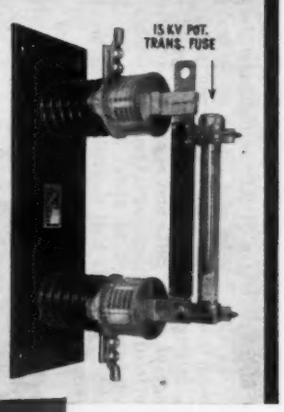
Thus S & C Resistors and DLC (low current) Fuses give *double* protection—reducing thermal stresses on the system during a short circuit—and protecting costly connected equipment. Accuracy of metering equipment is not affected.

Years of service make potential transformers more hazardous—and S & C protection becomes still more essential . . . Don't take chances on costly damages. S & C Fuse-and-Resistor combinations are giving insurance in thousands of applications. They will do the same for you. Easily applied in existing installations.





- *Visual Inspection*
- *Sealed Against Dirt, Dust, Water —No chance of flashovers between turns of resistor wire.*
- *Accuracy of Metering Equipment Not Affected.*
- *2300 to 138000 Volts.*



At top: *S & C Outdoor Fuse-and-Resistor Combination.*
Below: *Indoor Fuse-Disconnect-and-Resistor Combination.*

Ask for System Protection Data Pamphlet

SCHWEITZER & CONRAD, Inc.

4435 Ravenswood Avenue — Chicago, Illinois

ELECTRIFIED LAUNDRIES (Continued) 3

Textile Fiber Properties

Kind of fiber and weave of fabrics influence the various laundering processes: Natural fibers are vegetable (cotton and linen) or animal (woolens and silks). Synthetic fibers are processed from cotton linters and wood pulp. Removal of soil involves avoidance of shrinkage, felting (matting), tendering (loss of tensile strength) or decomposition of fiber, change of color. Silks and rayons are peculiarly susceptible to temporary tendering, woolens to felting and shrinkage (especially in hot washing solutions). Certain synthetic fibers decompose or melt at about 360 deg. F.; they stretch easily when wet and temporarily lose as much as half their dry strength. These considerations dictate the details of the laundering processes.

Washing

Three methods—Net (see Sheet 11), bulk (cylinder has longitudinal compartments), pocket (cylinder has vertical partitions). Each requires a slightly different formula because of different speeds and movement of articles. Some specify plain water or a "flush" as first step, others call for addition of soap and builder to form suds, some start with alkali only. First sudsing step (called "break") carried out at 80-100 deg. F. Succeeding steps use water up to 180 deg. F. (except that silks, woolens, colored goods, etc., must not be subjected to more than 100 deg. F.). About nine steps for cotton and woolens, five or six for silks. The operation times for three suds, a bleach, four rinses, a sour (neutralization of residual alkalinity) and a "blue" total to about 62 minutes for white goods and 57 minutes for light colors in typical practice. Thorough rinsing is of great importance in removing residual soap which would otherwise decompose in the sour bath. cause grayness and rancid odor (fatty acids formed).

In general, a washer consists of a perforated cylinder rotating inside a stationary shell. A reversing motor (or shifting belt) rotates the cylinder an equal number of revolutions alternately in each direction. Made of stainless steel, monel metal, maple or yellow pine.

General Duty Washers—For ordinary classes of goods (not blankets, curtains, delicate goods).

Ratings—Cylinder lengths (30-130 in.), diam. (30-60 in.), speeds (26-20 r.p.m.), capacity (20-1,200 pounds dry weight of goods), motors ½-15 hp.).

Motors—Reversible, low torque, drip proof; gear, belt or chain drive.

Control—Emergency push button, door interlocks, manual or automatic door spotting, inching devices to bring outer and inner doors flush.

Mfrs.—3, 16, 17. (See Sheet 14.)

Blanket Washers—For blankets and certain woolens which must be washed at low speed. Two-speed, double-duty washers used for these and general duty where more seasonal operation holds. Usually Y-pocket.

Ratings—Cylinders up to 48 in. diameter and 84 in. length. Motors 1-4 hp.

Mfrs.—3, 8, 9, 16, 37, 41. (See Sheet 14.)

Unloading Type Washers—Cylinder swings out of case to dump work into extractor containers or truck tubs. Shortens loading and unloading time.

Ratings—225-350 pounds, 42×64 to 42×96 in., motors 2-5 hp.

Mfrs.—3. (See Sheet 14.)

Sterilizing Washers—For hospitals and institutions. Steam at 25 lb. (267 deg. F.) to destroy harmful bacteria. Unloading in clean room on opposite side from loading.

Ratings—Cylinders up to 36×64 in., 150 lb. goods (dry), motors up to 2 hp.

Mfrs.—3, 16, 37, 41, 43. (See Sheet 14.)

Bleaching—Soil and stains not yielding readily to wash removal are subjected to bleaching agents (*e.g.* sodium hypochlorite or javel water) added to last sudsing or first rinse.

ELECTRIFIED LAUNDRIES (Continued) 4

Bleaches act chiefly as oxidizers to form colorless or rinsable compounds. Have tendering action if incorrectly applied. (See L. N. A. Special Bulletin 53.)

Souring and Bluing—Rinsing does not remove alkaline substances tenaciously absorbed by fabrics; if not removed yellowing may occur at ironing temperatures. "Sours" are diluted acids (acetic, oxalic, formic, sodium fluoride) to neutralize residual alkalinity and oxidize stains. Bluing masks residual tinge of yellow. Souring and bluing followed by final rinse.

LAUNDRY EQUIPMENT

Partial List of Principal Manufacturers

1	Allis-Chalmers Mfg. Co.	Milwaukee, Wis.
2	American Ironing Machine Co.	155 W. 56th St., New York, N. Y.
3	American Laundry Machinery Co.	Ross & Section Sts., Norwood, Cincinnati Ohio
4	American Monorail Co.	13,100 Athens Ave., Cleveland, Ohio
5	Amico Co.	105 4th Ave., New York City
6	Bishop & Co., G. H.	550 W. Washington Blvd., Chicago
7	Bock Laundry Machinery Co.	Toledo, Ohio
8	Chicago Dryer Co.	2210 N. Crawford Ave., Chicago, Ill.
9	Cohen & Son, Abe	2528 N. 12th St., N. W., Washington, D. C.
10	Cutler-Hammer, Inc.	1333 W. St. Paul Ave., Milwaukee, Wis.
11	Ellis-Dryer Co.	2244 N. Crawford Ave., Chicago, Ill.
12	General Electric Company	Schenectady, N. Y.
13	Goodrich Rubber Co., B. F.	450 S. Main St., Akron, Ohio
14	Goodyear Tire & Rubber Co.	1400 Cartwright St., Akron, Ohio
15	Graver Tank & Mfg. Co.	6300 Todd Ave., E. Chicago, Ind.
16	Henrici Laundry Machinery Co.	Henrici St., Boston, Mass.
17	Hopkins-Tull Machinery Co.	6245 State Road, Philadelphia, Pa.
18	Hungerford & Terry, Inc.	226 Atlantic Ave., Clayton, N. J.
19	International Filter Co.	61 E. Van Buren St., Chicago, Ill.
20	Jeffrey Mfg. Co.	956 N. 4th St., Columbus, Ohio
21	Jensen Mfg. Co.	Broad St., Palmyra, N. J.
22	Kaumagraph Co.	200 Varick St., New York City
23	Keystone Laundry Mach. Co.	Bridge St., Columbia, Pa.
24	Key-Tag Checking System Co.	6509 Hough Ave., Cleveland, Ohio
25	H. Kohnstamm Co.	83 Park Place, New York, N. Y.
26	Link-Belt Co.	300 W. Pershing Rd., Chicago, Ill.
27	Mateer & Co., F. W.	226 W. Ontario St., Chicago, Ill.
28	National Marking Machine Co.	4020 Cherry St., Cincinnati, Ohio
29	Pantex Pressing Machine Co., Inc.	Pawtucket, R. I.
30	Penna. Salt Mfg. Co.	1335 Chestnut St., Philadelphia, Pa.
31	Permutit Company, The	330 W. 42d St., New York City
32	Poland Laundry Mach. Co.	47 Kimble St., Roxbury, Boston, Mass.
33	Purkett Laundry Co.	Joplin, Mo.
34	Robbins Conveying Belt Co.	1934 Matchett St., Passaic, N. J.
35	Scaife & Sons Co., Wm. B.	Oakmont, Pa.
36	Shake Feed Method Co.	110 Knox Place, Joliet, Ill.
37	Smith, Drum & Co.	Allegheny Ave., Philadelphia, Pa.
38	Steele & Co., J. W.	1807 E. 17th St., Kansas City, Mo.
39	Stuart Laundry Mach'y. Co.	100 Charles St., New York, N. Y.
40	Super Ironer Corp.	St. Joseph, Mich.
41	Troy Laundry Machinery Co.	1930 Thomas St., East Moline, Ill.
42	Unipress Co., Inc.	3725 Chicago Ave., Minneapolis, Minn.
43	U. S. Hoffman Machinery Corp.	109 Fourth Ave., New York, N. Y.
44	U. S. Rubber Products Co.	1792 Broadway, New York, N. Y.
45	Westinghouse Electric & Mfg. Co.	E. Pittsburgh, Pa.
46	Zeigler Laundry Machinery Co.	450 Whitlock Ave., New York, N. Y.

BUILDING UP THE LOAD

New ideas and practices in selling electrical equipment and service to industrial, commercial and domestic customers

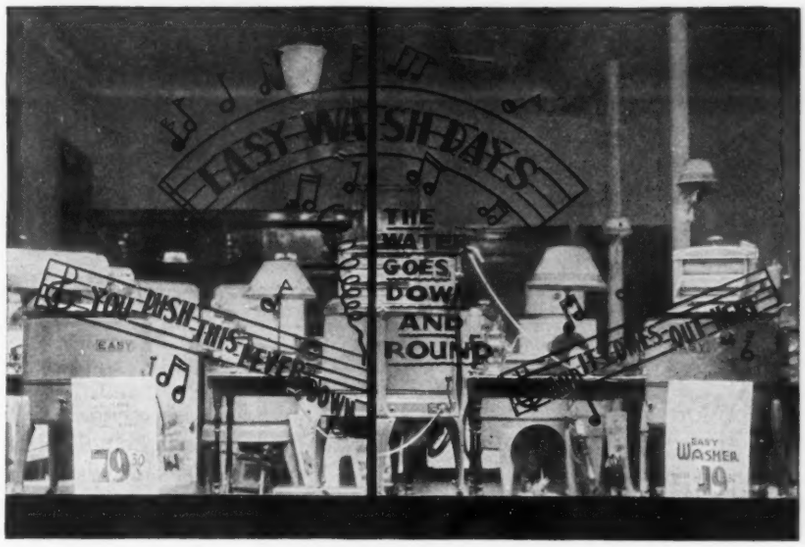
Energy Used by Modern Refrigerator

By R. M. WINSBOROUGH
Southwestern Gas & Electric Company, Shreveport, La.

In order to determine the estimated annual revenue from refrigerators on the system of the Southwestern Gas & Electric Company sub-meter records on thirteen refrigerators that were under three years old and on fourteen more than three years old were obtained.

The data are shown in the accompanying table. The total number of days metered for the refrigerators under three years old was 2,159. During this time these refrigerators used 3,556 kw.-hr., for an average of 1.6 kw.-hr. per day, or 48.2 kw.-hr. per month.

The table below shows that refrigerators more than three years of age use considerably more energy than the newer ones. These refrigerators were metered for a total of 21,092 days. During this time they used 38,913 kw.-hr. This is 2.1 kw.-hr. per day, or 64 kw.-hr. per month. These present-day machines are thus considerably more economical than those sold in years past and it appears reasonable to base estimates of revenue on machines under three years of age.



"Round and Round" Goes to Work

We knew that inevitably some one would put the "Ho-ho-ho" song hit to work. Central Maine Power Company has the words painted on the window at Gardiner, effectively coupled to its washer display.

Ranges on Trial Result in Sales

In February, 1933, the Hartford Electric Light Company inaugurated the practice of making ranges available on a trial basis. The company's annual report for 1935 presents the following figures to show the effectiveness of the plan:

Year	Ranges Sold	Sold, Replacing Trial Ranges	Trial Ranges at End of Year
1931	290	0	0
1932	325	0	0
1933	308	102	1,121
1934	618	356	1,747
1935	1,291	782	2,789

The report continues: "These figures indicate that the very real sales value to the dealers of this novel plan, and if further proof were necessary the enthusiasm with which the plan has been embraced by the dealers is most con-

Table of Operating Data on Electric Refrigerators

Under Three Years Old

No.	Age—Mos.	People in Family	Days Metered	Kw.-Hr.	Kw.-Hr. per Day	Kw.-Hr. per Month
1	9	4	206	453	2.2	66
2	19	4	30	12	0.4	12
3	12	4	29	72	2.4	72
4	24	4	30	66	2.2	66
5	16	7	122	88	.7	21
6	21	4	276	377	1.3	39
7	8	4	184	350	1.9	57
8	8	3	184	298	1.5	45
9	7	6	30	60	2.0	60
10	9	2	193	301	1.5	45
11	24	4	362	623	1.7	51
12	18	4	306	401	1.3	39
13	9	4	207	455	2.2	66
Totals	184	54	2,159	3,556	21.3	639
Averges	14.1	4.1	166	273	1.6	48.2

More Than Three Years Old

No.	Age—Mos.	People in Family	Days Metered	Kw.-Hr.	Kw.-Hr. per Day	Kw.-Hr. per Month
1	60	4	7	15	2.1	63
2	54	3	275	571	2.0	60
3	60	4	245	380	1.5	45
4	60	4	123	211	1.7	51
5	37	3	180	576	3.2	96
6	60	5	1,886	3,086	1.6	48
7	60	7	2,370	4,158	1.7	51
8	72	5	1,064	6,856	6.4	192
9	156	4	4,886	4,584	.9	27
10	72	5	2,087	3,846	1.8	54
11	84	2	2,387	4,014	1.6	48
12	70	2	1,976	2,692	1.4	42
13	60	1	1,559	3,221	2.0	60
14	72	2	2,047	4,721	2.3	69
Totals	977	51	21,092	38,913	30.2	906
Averages	69.8	3.6	1,505	2,779	2.1	64

Welding Demonstration on the Job

Prospects for welding equipment no longer have to rely upon the salesman's statements. The Victor Equipment Company, California distributor for G.E. welding equipment, built this special demonstration truck to show what welding can do for the prospective buyer right in his own plant. The truck is equipped with both an electric motor-driven welder and a gasoline-propelled set, making demonstrations possible at any location. The truck eliminates the need for expensive "trial" periods on approval.

vincing as well as gratifying and fully justifies the company's decision made in 1935 to abandon merchandising directly and rely upon the dealers to 'carry on' with this important phase of our promotional work."

As of December 31, 1935, the number of electric ranges served by the company was 8,166, representing a range density of 14 per cent.

•

Three Years Sales of Running Water

By P. M. ALDEN
Manager Retail Sales Department,
Philadelphia Electric Company

Back in the summer of 1932, in organizing our rural sales division, we made a careful survey of the rural market. It was decided to promote the sale of electric running water systems. A prospect list of 1,200 names was compiled and three direct mail advertising pieces prepared. Two cooperating manufacturers together contributed 20 per cent of the cost of this advertising.

In addition to our own mailing pieces, both manufacturers sent out broadsides to the same list on a schedule which tied in with our mailing, so that the prospective customer for electric pumping equipment received a total of some nine pieces of literature over a total period of approximately twelve weeks.

Each rural salesman was assigned 150 prospects, and when they called, following the mailing of the second piece, endeavored to interest the prospect sufficiently to talk to a dealer concerning the actual purchase and installation of a running water system. Such prospects were considered "Class A" and were turned over to the cooperating manufacturers for distribution to local dealers. All other hopeful prospects were followed up in 60 days. Our rural supervisors and salesmen co-operated closely with the dealers in the field and were at all times available to assist local dealers in the closing of sales and the determination of approximate operating costs.

This first campaign in 1932 covered the months of September, October and November. Dealers received leads for 159 prospects and 30 were sold. Another similar campaign ran from September 15 to November 15, 1933, in which we prepared no special advertising of our own. There were 202 prospects for the dealers and 83 sold.

With the organization of the Electric Water Systems Council, our company was in a favorable condition and our campaign during the fall of 1934 was particularly successful. No small part of this success was due to the excellent national publicity given the subject of electric water systems by the Electric Water Systems Council. We used its mailing piece to a list of 1,500, secured by another survey. As a result 373 prospects produced 232 sales. Intensification of the activity sold 408 more in 1935. This was more than 200 per cent of the quota of both pump installations and the pump energy revenue ($3,500) scheduled. The present total revenue ($11,403) triples the previous receipts from the same customers.

Incidentally, all our rural salesmen are paid a straight salary, as we have found that promotional selling of the type they do does readily adapt itself to the commission plan. This is particularly so because a large part of the work of the salesmen in the rural field must be in the nature of consulting service to the farm, which frequently does not immediately result in increased revenue to the company. But it eventually brings the customer to the use of electric equipment for farm purposes rather than the application of other types of prime movers to the rural problem.

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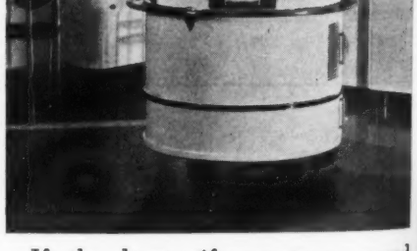
New Range Approach



If the housewife wants a round range with surface units accessible from all four points of the compass she can probably have it. If the salesman thinks he can sell the idea he has the chance. Briggs of Detroit suggests this as a feeler. It is on castors, has a towel drier, room heater, broiler, grill, toaster, condiment rack on the lamp column, and even a rail—around the top.

Be Sure TO SEE THIS BOOK

EVERY electric man should read the dynamic story of the electric range and water heater business as told in Hotpoint's new book of Sales Opportunities — "Now is the Time" — just off the press.

Every person in the industry, who is now old enough to shave, will see instantly that this new book dramatizes facts which point the way to surging new opportunities for those alert enough to take the tide of public opinion at its flood.

Ask the Hotpoint representative in your district to show you this important new book — or write today for your copy. Note especially these vital facts which exist today:

Low Priced Ranges — headed by the DORIAN remove the price barrier and put electric ranges on a competitive price basis with fuel type ranges.

Sweeping Public Acceptance — Read how surveys show that 30% of housewives *know* they want electric ranges — see how editors of women's magazines and newspapers throughout the country reflect the swing in public opinion to electric cookery.

New Home Building and Home Furnishing Business Active. This new Hotpoint book shows how home building and home furnishing sales are increasing by leaps and bounds and gives you the tools with which to capture range business.

National Advertising — See how Hotpoint saw the "straws" in the wind, learned that *now is the time* for a big range and water heater campaign — and began advertising with color pages in the Saturday Evening Post, Ladies' Home Journal, McCall's and full pages in Good Housekeeping and Better Homes and Gardens.

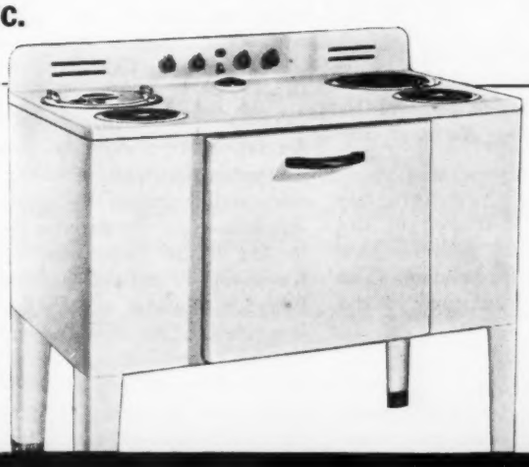
Hotpoint has timed its Big Campaign to the psychological moment. Don't delay. If you have not seen this book — get in touch with your Hotpoint representative at once.

EDISON GENERAL ELECTRIC APPLIANCE CO., INC.
5618 West Taylor Street, Chicago, Illinois

THE VITAL STORY OF CALROD

— Now the remarkable story of Calrod, Hotpoint's Hi-Speed heating coil, is told to the public with color pages in the Saturday Evening Post. This is making the public realize that Calrod means to Cookery what Mazda means to Light.

Right — Hotpoint's New DORIAN *Range — a large 39" range with full size oven at a remarkably low price.*



Hotpoint is ready for the big swing to Electric Water Heating with the most complete line of Water Heaters in the industry. Learn about Hotpoint's five exclusive features which place this new and complete line far in the lead.

ELECTRIC **Hotpoint** RANGES

WATER HEATERS

MEN OF THE INDUSTRY

Couch Quits as Head of Two Power Companies

Harvey C. Couch, an outstanding figure in public utility circles in the Southwest and organizer of three large power and light companies in as many states, announced his resignation as president of two of these systems recently but will retain his connection with the third—he remains as president of the Arkansas Power & Light Company, having been re-elected at the annual organization meetings.

The companies from which Mr. Couch retires as chief executive officer are

Louisiana Power & Light Company and Mississippi Power & Light Company. Rex Brown, who has been a vice-president of the Mississippi company for several years, has been chosen to succeed Mr. Couch as president of that concern (ELECTRICAL WORLD, March 28, page 76). The top post with the Louisiana system has not as yet been filled.

•

▶ WILLIAM RANDOLPH GRYMES is the new manager for Virginia Public Service in Orange, Va. He succeeds Paul H. Scott, who has become clerk of the county court.

▶ FRANK P. WALSH of New York has been reappointed as a trustee of the Power Authority of the State of New York by Gov. Herbert H. Lehman. The appointment has been confirmed by the State Senate.

▶ WIRT S. SCOTT, formerly special representative of the Westinghouse Electric & Manufacturing Company, Mansfield, Ohio, is now connected with the industrial sales department of the Philadelphia Electric Company. His duties consist in making complete investigation of manufacturing processes in industrial plants and an analysis of present and future possibilities for electric power loads. Mr. Scott is recognized as an authority in the economic study and application of electric heating for industrial and commercial processes and is one of the best-known technical writers and lecturers in the United States.

•

G. V. Pollard Works Manager of Kelvinator Operations

G. V. Pollard has been appointed general works manager in charge of Kelvinator manufacturing operations at Detroit and Grand Rapids, it was announced by G. W. Mason, president and chairman of the board of the Kelvinator Corporation. Mr. Pollard has been director of quality for Kelvinator since 1928, in which capacity he was in constant touch with all phases of the manufacturing and production of Kelvinator products and their rigid inspection before release to consumers.

Before his connection with Kelvinator, Mr. Pollard had years of experience with manufacturers of automobiles and allied products.

•

▶ W. D. BLACK, representative of the city of Hamilton, Canada, on the Hamilton Hydro-Electric Power Commission, has been chosen chairman for 1936.

▶ JAMES M. DEGNAN has been appointed general sales manager of the Hill Diesel Engine Company, Lansing, Mich. Mr. Degnan has been associated for the past ten years with the Worthington Pump & Machinery Corporation.

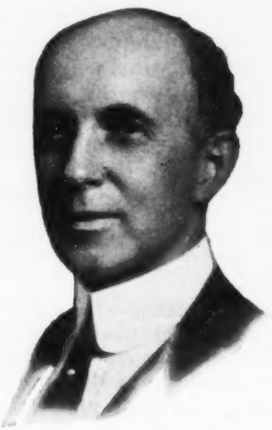
▶ CHARLES B. FRICKE of Columbus, president of the Loup River public power district, has been elected chairman of the advisory committee of Nebraska's three largest federally financed power projects. Other members named are George E. Johnson of Hastings, general manager of the Tri-County Power and Irrigation District, vice-chairman in charge of power sales and revenues, and C. H. Fisher of Ogallala, representative on the committee for the Platte Valley district, treasurer. K. Sewell Wingfield, assistant chief of P.W.A.'s division, and P. F. Hopkins of Des Moines are P.W.A. representatives on the committee. A secretary will be named soon, as well as a chief engineer or general manager. The committee is expected to adopt a site for permanent offices and make definite arrangements for co-ordinating the power phases of the three projects—Loup, Central Nebraska (Tri-County) and the Platte Valley districts.

Dr. Frank B. Jewett Awarded Franklin Medal

The Franklin gold medal has been awarded to Dr. Frank B. Jewett, president of Bell Telephone Laboratories and vice-president of American Telephone & Telegraph, the Franklin Institute of Philadelphia announces. The medal, an annual award since 1914, will be presented May 20 in Philadelphia.

The award, the institute states, was made to Dr. Jewett "in recognition of his many important contributions to the art of telephony . . . in the great laboratory of research which he organized and which he has directed with such signal success."

Dr. Jewett was graduated in 1898 from the Throop Polytechnic Institute (now California Institute of Technology), received his Ph.D. from the University of



Chicago and served at the latter institution as research assistant to Prof. A. A. Michelson. He joined the Bell System in 1904 and his early work related to loading and use of phantom and cable circuits.

He receives a large measure of personal credit for the success of radio telephony in 1915 and later development of the permalloy submarine cable, carrier or multiplex systems, and very recently the coaxial transmission line between Philadelphia and New York.

•

Idaho Power Appoints R. E. Gale Sales Manager

Organization changes in the Idaho Power Company involve a switch of L. W. Brainard, formerly sales manager of the company, to Payette as division manager, and the succession of R. E. Gale, formerly division superintendent at Boise to sales manager. J. C. Baldridge, formerly manager of the Payette division, has been brought into the general office in Boise, where he will assume special duties.

Mr. Brainard's move from the commercial to the operating department was made at his request, since it has been his desire to gain operating experience;

SMASHING THROUGH
TO GREATEST GAINS IN HISTORY!

ALREADY, 1936 CARLOAD ORDERS FOR FRIGIDAIRE ARE MORE THAN DOUBLE THOSE FOR ANY SIMILAR PERIOD!

● The sensational New Frigidaire with the Meter-Miser and the "Buy on Proof" program are breaking sales records for dealers everywhere. Never before has America given such a tremendous welcome to any refrigerator. Families by the thousands are buying on Proof! They're choosing the New Frigidaire with the Meter-Miser because it meets All Five Standards for Refrigerator Buying — with Proof. . . . 1. Proof of Lower Operating Cost. 2. Proof of Safer Food Protection. 3. Proof of Faster Freezing — More Ice. 4. Proof of More Usability. 5. Proof of Five-Year Protection Plan. . . . Dealers are amazed at the power of this unbeatable combination — an outstanding new product and the most forceful, workable sales and advertising program they've ever known. It's a combination that is gathering irresistible momentum with each passing day. . . . The Big Push is on! And Frigidaire selling men are definitely on their way to the most sensational success in the history of the business.

FRIGIDAIRE
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he has been sales manager for many years. Mr. Gale gained his utility experience largely in the engineering department of the company, where he worked for several years prior to becoming division superintendent in Boise a few years ago.

•

Gossler Made Chairman of Columbia Gas & Electric

Philip Green Gossler, who relinquished the presidency of Columbia Gas & Electric Corporation last week to step into the board chairmanship left vacant by the death of George W. Crawford nearly

a year ago, has been prominent in the electrical industry almost from the day he received his electrical engineering degree from Penn State in 1892. He was born in Columbia, Pa., on August 6, 1870, and joined United Electric Light & Power Company in New York after leaving college. While serving this company as assistant engineer, he took a post-graduate course in electrical engineering at Columbia University.

In 1895 Mr. Gossler went to the Royal Electric Company, Montreal, as superintendent and engineer. In 1901 he transferred to Montreal Light, Heat & Power, where he was general superintendent and engineer. He returned to the United States as a vice-president of J. G. White & Company (1904-09) and became chairman of Columbia Gas & Electric Company of West Virginia in 1909. He was president as well as chairman from 1922 to 1926, and became president of the new Columbia Gas & Electric Corporation when it was organized in the latter year.

•

▶ A. P. Gilmore, formerly division meter superintendent of the Georgia Power Company at Rome, has been appointed Rome district superintendent to succeed the late J. B. Cooper. J. C. Lifsey, formerly connected with the Macon division, has been appointed meter superintendent in Rome. F. H. Robinson, who had been Rome division distribution engineer since 1927, was transferred to the general office operating staff. S. L. Hancock, Jr., formerly Rome district engineer, was promoted to the position vacated by Mr. Robinson. A. R. Perdue, Carrollton district engineer, was transferred to Rome and promoted to distribution engineer for the Rome and Cedartown districts.

▶ Paul Nitze, representing Dillon, Read interests, has been added to the executive committee of the American Light & Traction Company.

▶ Frank V. Burton, well known to the electrical trade, is now associated with the Philadelphia office of Stanley & Patterson, manufacturer of electrical signaling apparatus.

▶ R. Gilman Smith, who is connected with the Harrison Williams organization, has been elected a director and member of the executive committee of the United Light & Power Company. He succeeds Edward L. Love, vice-president of the Chase National Bank. He also has replaced Mr. Love as a director of the United Light & Railways Company and of the Continental Gas & Electric Corporation. Mr. Smith has also been added to the executive committee and the board of directors of the American Light & Traction Company.

▶ Charles G. Blakeslee, counsel to the New York Public Service Commission, whose resignation became effective on April 1 (Electrical World, March 28, page 78), will join the law firm of Riggs & Baldwin, New York.

▶ A. V. Morris, president of the First National Bank of Amsterdam, N. Y., and Thomas H. Guy, Troy attorney, have been elected directors of Mohawk Hudson Power Corporation.

▶ L. H. Heinke of the United Light & Power Company was elected a member of the board of directors of the American Light & Traction Company at the recent annual meeting.

OBITUARY

W. S. Heald

W. S. Heald, vice-president of the Shanghai Power Company, died April 6 in Cairo, Egypt, of spinal meningitis, according to information received at the offices of the Shanghai utility's parent company, the American & Foreign Power Company in New York. Mr. Heald was en route to the United States on vacation after five years' service in Shanghai. For many years Mr. Heald was general sales manager for the Minnesota Power & Light Company. Previously he had been general sales manager for the Duluth Edison Company. He had worked as an electrical engineer on the Keokuk Dam. While in Duluth Mr. Heald was active in association work, having served as president of the North Central Electric Association. He was a graduate of the University of Michigan.

•

Charles A. Dauchy

While attending court at Adel, Iowa, on February 26, Charles A. Dauchy, rate engineer of the Iowa Electric Light & Power Company, was stricken with heart trouble and died almost instantly. Mr. Dauchy was born in 1896 at Van Horne, Iowa. He was a graduate in electrical engineering from Iowa State College. He entered the employ of the company in 1915 in the mechanical and electrical department and in 1925 was transferred to the rate division, where he got his education in rates and rate making under the excellent tutelage of the late W. J. Greene. Only shortly before his death Mr. Dauchy had added to his responsibilities by taking over the job of directing the Iowa Utilities Association on the retirement of Joe Carmichael from active duty.

•

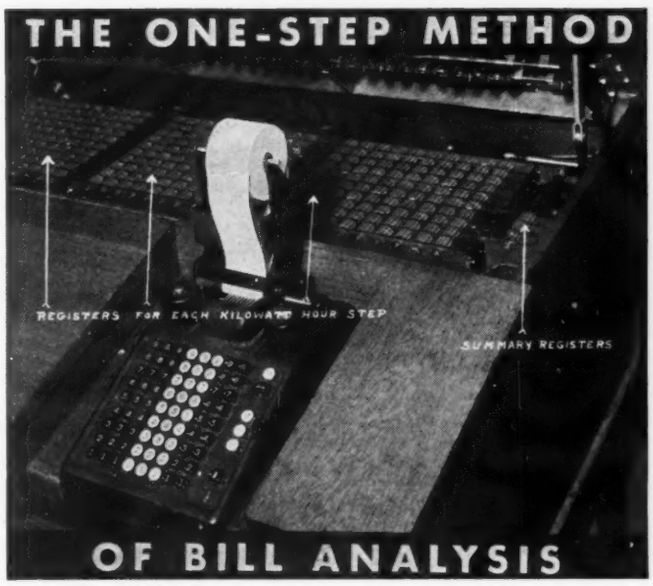
Theodore Beran

Theodore Beran, for many years an employee and officer of General Electric Company and its predecessor companies, died in New York on April 2, at the age of 73. Mr. Beran had been confined to his home for a month and had been in poor health for about two years. A native of Springfield, Mass., Mr. Beran was a graduate of New York City College and joined a G.E. predecessor in 1889. He became acting manager in the New York district in 1903, was named manager in 1904 and was made commercial vice-president of General Electric in 1926. In 1928 he retired. Mr. Beran belonged to A.I.E.E., the American Arbitration Association, the Engineers and Bankers clubs and was a former vice-president of the Electrical Board of Trade of New York.

•

▶ Thomas A. Barry, for the past 23 years a sales engineer attached to the Boston office of the General Electric Company, and widely known in the New England utility field, died suddenly, of a heart attack, in Cambridge, Mass., on March 30. He had been in the employ of the company since 1909, and specialized in sales to properties identified with the New England Public Service Company group. He was 49 years of age.

Reduces Cost of Consumption Analyses



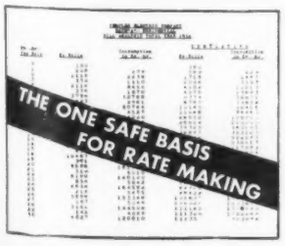
R. & S. Bill Frequency Analyzer: This machine we developed especially for our Public Utility Rate Service. The kw.-hrs. billed are entered on the adding machine keyboard. A tape is prepared of all items and a consumption total accumulated, which serves as a control. At the same time—by this single operation—the bill count for each kw.-hr. step is made by the electrically controlled accumulating registers.

No longer need the barrier of expense and clerical labor stand in the way of complete and accurate consumption analyses.

The newly developed R. & S. Bill Frequency Analyzer reduces to a single step the whole complicated operation of counting the number of monthly bills by kw.-hr. steps—and proving the totals.

By its use the skilled staff of Recording & Statistical Corporation can prepare your consumption reports—directly from billing register or other customary record—at a cost you will find surprisingly low.

Investigate the advantages of this method for either special or current bill analysis service.



Bill Analysis for one rate. Revenue effect of any proposed rate may be readily determined.

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NEW EQUIPMENT AVAILABLE

Current Overload Switch

Automatic current overload protection is provided in this combination control device which functions as a manually operated switch. A bimetal strip, serving as a mechanical latch, connects the switching member and its movable contacts with the handle. Excess overload causes the bimetal strip to bend sufficiently to break the circuit. On-and-off manual operation is positive toggle make and quick break.

"Protectit;" type BH has nineteen interchangeable elements from 1.3 to 14.2 amp.; type B, ten fixed ratings ranging from 1.3 to 15 amp.; maximum voltage rating 250. **Colt Patent Fire Arms Mfg. Co.**, Hartford, Conn.

•

Bullet-Resisting Insulator

A rugged suspension insulator for use on line sections where shooting and rock throwing are experienced is now available. This new insulator is made without petticoats. The smooth lower surface tends to deflect a rock or bullet with less damage to the insulator. In addition the maker claims the

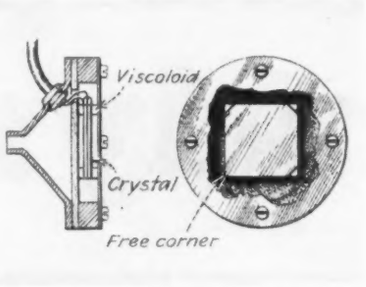
Furnished with 10-in. disks in both 5 and 5¼-in. spacing; choice of either ball-socket or clevis attachment can be had in the 5¼-in. spaced unit; the 5-in. spaced unit has only the ball-and-socket attachment. **Ohio Brass Co.**, Mansfield, Ohio.

smooth under surface makes cleaning of the insulator both easier and quicker. Mechanical values of the insulator are the same as those of the regular 15,000-lb. suspension type. Dry flashover values are approximately the same as the regular insulators. Wet flashover values are slightly lower due to absence of petticoats.

•

Vibration Pick-up

This new vibration pick-up for studying the mechanical vibration of parts uses the piezo electric properties of rochelle salt crystals to convert vibration into electrical energy for oscillographic study. These crystals, when subject to strain, cause an electric charge to appear on their surfaces. The charge is proportional to the amount of bending, and if the bending is vibratory the electric charge will also vary at the same rate. When the grid circuit of a linear amplifier is connected across the electrodes fastened to the two faces of the crystal the plate current will vary in accordance with this charge. The square crystal is fastened



Output, 0.25 volt per 0.001 in. movement at 250 cycles per second. Stock No. 9649. **RCA Manufacturing Co.**, Camden, N. J.

at three corners, the fourth corner being free to vibrate due to its inertia. Sensitivity increases approximately as a square law, with increases in frequency up to 3,000 cycles per second.

•

Three-Phase Transformer

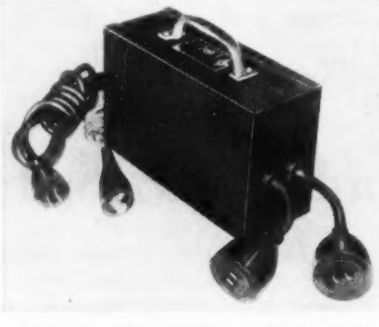
Sizes from 1 to 50 kva.; semi-portable type for floor, wall or ceiling mounting. **Forbes & Myers**, Worcester, Mass.

These portable, air-cooled transformers are designed for use by demonstrators and others who find different voltages available to them in various locations where their machinery is to be set up. Transformers are equipped with terminals for 220, 440 and 550 volts, all three phase, 60 cycles. Where two-phase or other voltages are desired they can be furnished. When the transformer is connected to any one of the three voltages named above it will supply either one or both of the remaining voltages at the same time.

•

Safety Transformer

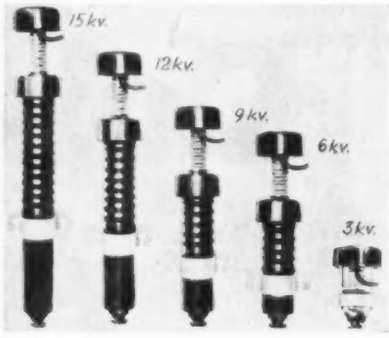
Developed for the express purpose of increasing the safety factor in inspection or maintenance service where the work must be done with electric illumination in moist or damp places or in buildings permeated with explosive vapor or fumes.



Primary voltage 110; secondary, 32 volts. **Acme Electric & Mfg. Co.**, Cleveland, Ohio.

Lightning Arresters

"Crystal Valve" lightning arresters embodying the use of glass in their structure are now available for distribution service with voltages from 1,000 to 15,000. Two



Type CV forms 3, 7, 8, 9 and 10 for voltage ratings of 3, 6, 9, 12 and 15 kv. respectively. **Electric Service Supplies Co.**, Philadelphia, Pa.

types of body construction are employed; that for the 3-kv. unit embodies a unitary body, housing the spark gap assembly and the characteristic element; a glass cap covers the upper end of the glass body. For the 6, 9, 12 and 15-kv. units composite construction, using porcelain for the housing characteristic "Crystellite" element and "Pyrex" glass for housing the spark gap structure, is employed. The primary advantage of the transparent housings is that the internal spark-gap structure may be readily inspected either as a part of routine practice or under special conditions.

•

Rural Line Neutral Clamp

This light, simple clamp is designed to carry the neutral wire at the tangent points of farm lines. A through-bolt used to support the clamps also tightens it. As the through-bolt is tightened the keeper piece is

Ohio Brass Co., Mansfield, Ohio.

drawn down along the surface of the inclined plane, clamping the conductor tightly. Provision for grounding the neutral at any pole is made by a groove in the upper half of the keeper piece. An additional clamp is not needed. The clamp may also be used for supporting ground wires at the tops of poles.

•

Furnace Input Controller

Control of input to furnaces, ovens, plattens and other units electrically heated is accomplished with this controller. Model M is designed to prevent constant load from rising in temperature beyond a desired setting. Model MT exercises the same control but is provided with built-in time control,

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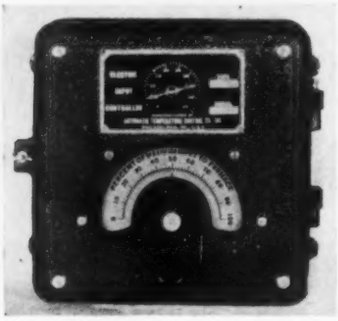
which provides control after an adjustable period. Models F and FL are for use where loads are variable. Both these models adjust automatically to changes in demand, with model F serving installations having but slight lag in furnace response and model FL serving where lag is greater. Adjustment is by an external knob which varies



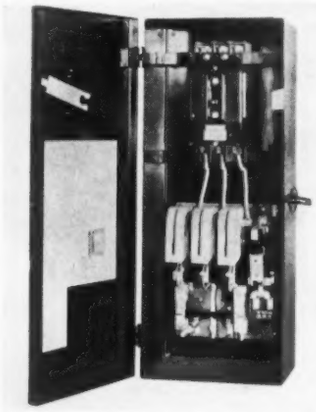
Capacities greater than 10 amp. on 110 volts are provided with mercury contact tube rated at 90 amp. **Automatic Temperature Control Co.**, Philadelphia, Pa.

the position of a 10-amp. snap switch in relation to a rotating cam. This adjustment determines the period during each cam rotation that current will be flowing to the heating unit.

•

Combination Switch

A new line of combination magnetic switches utilizing air circuit breakers which can be reset by hand after tripping is now introduced. Breaker-operating handle is interlocked with inclosing case door so that it cannot be opened when the breaker is closed. The breaker can be locked either open or



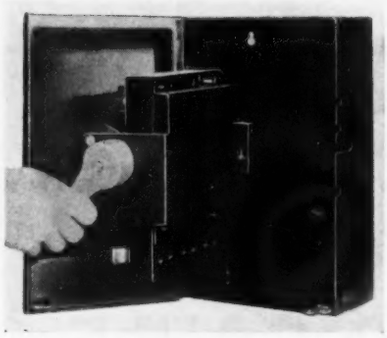
Maximum ratings 25 hp. at 220 volts, 50 hp. at 440 volts to 600 volts. **General Electric Co.**, Schenectady, N. Y.

closed, from the outside of the case. This new line parallels but does not supersede a line of similar ratings incorporating magnetic switch with overload relays for motor-running protection.

•

Swing-Out Feature Extended

The swing-out feature has been newly incorporated in this make type C and general-purpose switches. Free access to the interior of the switch for wiring purpose, is made possible by permitting the operating mechanism to be swung away from the box. Elevating the base from the back of the box so that wires may be run underneath it provides greater wiring space. The swing-out feature has already been applied to this company's industrial



Type C and general-purpose switches, 30 and 60 amp. **Square D Company**, Detroit, Mich.

circuit breaker line in 50- and 100-amp. frames as well as to two lines of 30- and 60-amp. new-sequence service-entrance equipment.

•

Noise and Fault Locator

Model 233. Size 12x12x7½ in. Weight 23 pounds complete. Frequency range 550 to 1,500 kc. Sensitivity range 2 to 200,000 microvolts. **Tobe Deutschmann Corporation**, Canton, Mass.

Requirements of distribution engineers for apparatus capable of indicating quickly and accurately the points at which radio noises originate are said to be met with this instrument. Extreme portability and light weight permit the instrument to be carried in the field to locations inaccessible to automobiles. Two controls—a noise selector and sensitivity adjuster—are required to operate the unit. The noise selector allows adjustment to the maximum response at the desired frequency and the sensitivity adjuster enables the operator to obtain whatever degree of sensitivity is required for checking noise fields up to 200,000 microvolts. A steel rod antenna is used which has a length of 28 in. when its four parts are telescoped together.

•

Relay Unit

A new photo-electric relay using "Visitron" photo tubes is now available for use on 110-120 volt, 50-60 cycle circuits. The apparatus is said to be of particular interest to manufacturers supplying photo-electric relays with equipment of their own make. It is equally suitable for the requirements

Model 5351-D; 3-in. lens shown. **G. M. Laboratories, Inc.**, Chicago, Ill.

of any standard photo-electric applications. A 3-in. lens aperture is used for increasing the sensitivity of this unit. Other models are available with 2-in. lenses, with rectangular apertures and no lenses, and with no aperture for use with separate photo-tube housings.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

Air-break switches for use on medium- and low-voltage transmission lines and which are made up like a dead end section of line using disc-type susupension insulators are described fully in a 20-page bulletin (No. 108) of the K.P.F. Electric Company, San Francisco, Cal. Specification of the various switch parts are discussed individually and, in addition, assembly drawings are included to illustrate application of the switch. Full dimension and rating data is given.

Smoot Combustion Control for Boilers is a new publication (Data Book No. S-20) of the Republic Flow Meters Company, Chicago. As well as describing the Smoot control system as applied to all kinds of fuel and fuel firing, the book also presents a concise discussion of the basic problems in boiler operation and an evaluation of their importance in the final desired result of efficient steam generation.

Arc Welding Electrodes and Accessories is an interesting new publication of the Lincoln Electric Company, Cleveland, Ohio. Included in it are descriptions of numerous types of welding electrodes with many striking illustrations of their use. Also treated in detail are the rod holders, cables shields, masks, protective clothing and other appurtenances of the welding art.

A.S.T.M. Standards of Electrical Insulation Materials (1935 edition) presents 25 methods of test and ten specifications for testing and evaluating electrical insulating materials and includes the current report of committee D-9. Copies can be obtained from A.S.T.M., 260 S. Broad St., Philadelphia—$1.75 each.

"Six Tested Ways to Make Lighting Pay" is a 14-page bulletin of the Benjamin Electric Manufacturing Company, Des Plaines, Ill., which, as the name implies, lists a number of recommendations covering the selection, application and care of industrial lighting fixtures.

Specifications for the new "Duro-Brace" texrope sheaves are tabulated in a 10-page bulletin (2188 A) recently announced by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Standards for Rating and Testing Air Conditioning Equipment and Standard Methods of Rating and Testing Mechanical Condensing Units are two publications prepared by the joint committee on rating commercial refrigerating equipment of the American Society of Refrigerating Engineers. Both standards are tentative and subject to minor changes. Copies may be obtained for 20 cents and 15 cents, respectively, from the A.S.R.E. headquarters at 37 West 39th Street, New York City.

Magnetic Core Materials Practice, a data book that has had wide circulation since its first appearance about a year ago, has been reissued in a revised and enlarged edition by the Allegheny Steel Company, Breckenridge, Pa. The book is in three sections, one on the selection of core materials, the second on method of testing them and the third on their physical and mechanical properties. The text is profusely illustrated by curves and tables of data.

Motor parts for some 50 different makes of motors are listed in catalogue No. 47 (95 pages) now available from the Reading Electric Company, 200 William Street, New York City.

MONEL METAL *is* "TOPS"...

with all of these Electric Ranges!

UTILITIES and appliance dealers, always alert to the home owner's preference, feature electric ranges topped with Monel Metal.

This home owner preference has been built by years of continuous advertising in national magazines, and increased by the trouble-free performance of Monel Metal equipment of all sorts in thousands of kitchens.

Solid metal through and through, with no coating to chip, crack or wear off, a Monel Metal work top goes triumphantly through the drudgery of the kitchen . . . but never looks the drudge. Monel Metal *retains* its gleaming beauty, even through long years of abuse from heavy pots and pans.

When you specify Monel Metal work tops for the ranges you sell, you add a very definite sales inducement. For women who know, prefer Monel Metal . . . and most women know.

Send coupon for free display cards, to use on the ranges with Monel Metal work tops now on your floor.

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Look in the Buyers Reference Number of Electrical World

IF you are looking for an electrical product —want to know who makes it—or know the trade name and want to know the manufacturer—you will find a quick and ready source of information in the Buyers Reference Number of Electrical World.

The directory section classifies the products of about 3500 manufacturers under nearly a thousand main headings with over two thousand cross references.

The trade name and company index, comprising 33 pages arranged alphabetically, will help to locate any product when only the trade name or manufacturer's name is known.

The products exhibit section gives further details on the products of individual manufacturers, district offices, warehouses, etc.

ELECTRICAL WORLD

330 West 42nd St.,

New York, N. Y.

Headquarters for Everything Electrical

Logan Steam Plant— A Landmark

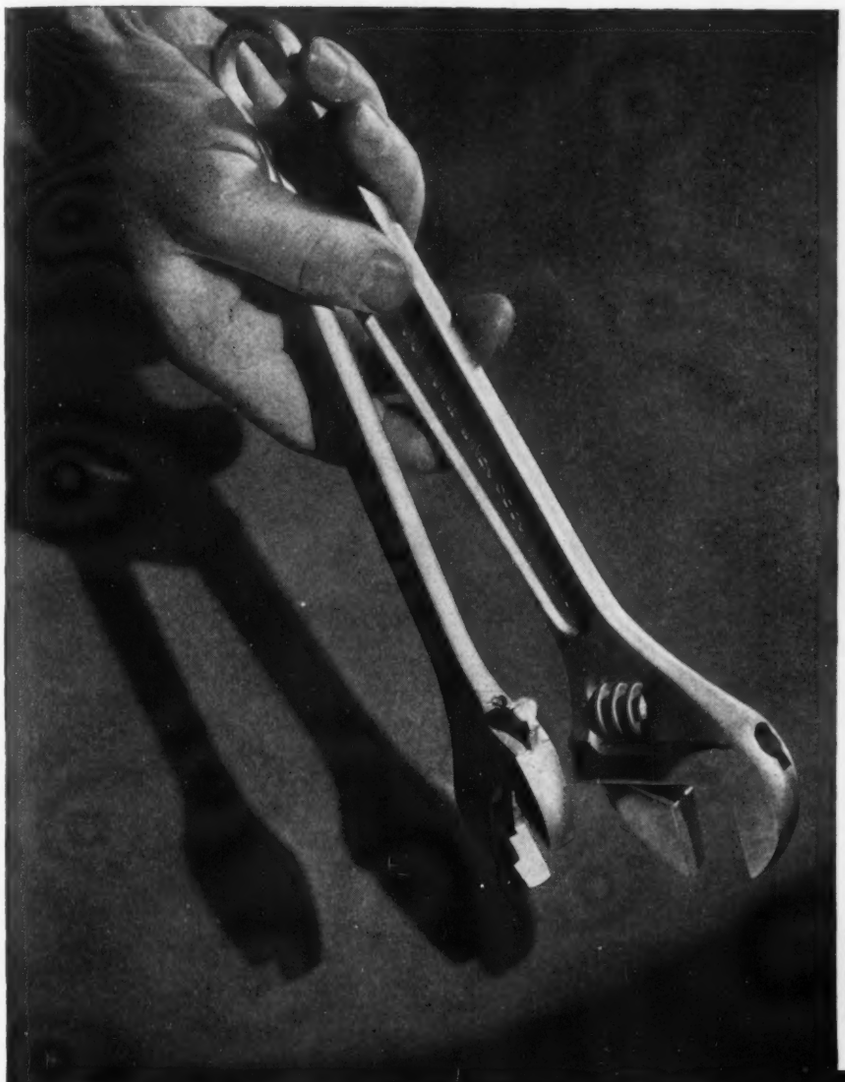
[*Continued from page 33*]

hour at 1,325-lb. pressure and 925 deg. F. Superheater temperature will be regulated by a bypass, with an expected tolerance of plus or minus 10 deg. The boiler will be a six-drum, double V-type unit using tangent tube construction for the water walls, tangential firing and dry bottom. Superheaters will be of the convection type, vertically supported; economizers of the return bend tube type.

The question of the type of bottom was given particular attention, and the final decision to go to dry bottom was based upon the fact that, with the development of other superposed plants on the system, it was felt that more and more would it become necessary for individual superposition installations to operate at comparatively low rating or face the necessity of being shut down completely, a procedure totally unsuited to sound operation of high-temperature, high-pressure, large-size boiler units. Hence, a load range of 5:1 was requested. No wet bottom design available at the present time seemed capable of fulfilling this for the range of ash fusion temperatures expected to be handled on this particular job.

This question of ash-fusion temperatures received particular stress in the study of gas temperatures in the upper reaches of the boilers. It was felt that in order to make available to the plant all the economical sources of fuel, a range of fusion temperatures would have to be handled on this job greater than that normally encountered on any particular installation. The range chosen was from 2,300 deg. F. on the lower end up to 3,000 deg. F. on the upper end. The boiler dimensions, including the relative distribution of surface between water walls and the rest of the boiler on the design chosen, gave, it was felt, the maximum assurance of keeping liquid or viscous ash out of the upper boiler reaches over the entire range of operation up to and including full guaranteed rating.

Boiler efficiency was, of course, given consideration, but the efficiency chosen was frankly not the maximum that might have been attained if additional surface had been utilized. In this particular design it was felt that the most economical balance was the one which gave less weight to the



Modern WRENCHES *for Better* LINEWORK

CRESTOLOY STEEL WRENCH

THESE modern adjustable wrenches with their lean symmetry, better balance and extraordinary strength are ideal for linemen.

Forged from *Crestoloy* steel, they are one-third thinner than ordinary adjustable wrenches, yet actually more than *twice* as strong. A 10 inch wrench with a capacity opening of 1 1/8 inches weighs less than 13 ounces —adds little to the weight of a lineman's belt.

All Crestoloy Wrenches are heavily chrome-plated—heads polished bright and handles specially finished to provide maximum "traction" even when hands are wet or oily. Seven sizes from 4 to 24 inches. Ask your supply house or write for the New Crescent Catalog of guaranteed hand tools.

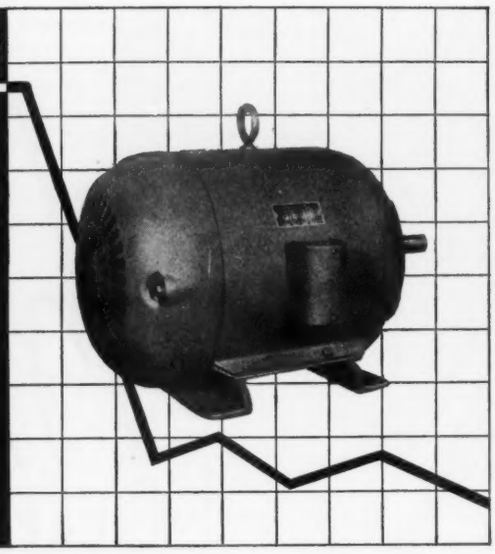
CRESCENT TOOL COMPANY
Jamestown, N. Y.

WATCH YOUR

MAINTENANCE COSTS GO DOWN

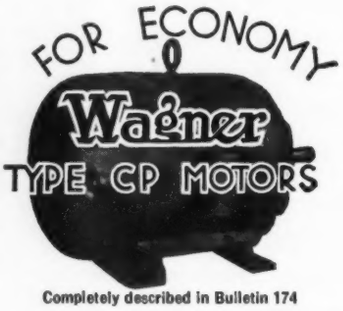
After Installing WAGNER TYPE CP MOTORS

Where Dust, Fumes, Moisture Are Prevalent



WHEN motors are to be exposed to destructive elements which short-circuit, clog, or corrode them, Wagner totally-enclosed fan-cooled type CP motors will reduce your maintenance costs, because they are provided with two frames: (1) An outer frame which guides a strong cooling draft over the motor—protects the motor against the elements and makes it unnecessary to erect special housings; (2) an inner frame which completely seals the motor proper against dust, fumes, and moisture—and reduces maintenance to an absolute minimum.

Actual use of Wagner type CP motors under adverse dust, fume, or moisture conditions, over long periods, have proved that maintenance costs are materially reduced after installing Wagner type CP motors. The use of open-type motors under these conditions would have entailed frequent shutdowns for cleaning, curtailed production, and extra hours of overtime.



Completely described in Bulletin 174

ML236-2B

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, U.S.A.

MOTORS TRANSFORMERS FANS BRAKES

B.t.u. efficiency, but gave the maximum weight to over-all economy and to reliability and availability.

Summary

The above brief description gives the high spots of the whys and the aims sought in the Logan superposition job. Some of these aims outlined above are obviously high. Nevertheless, it is felt that the majority are definitely realizable. To bring such realization about, it is true a great many engineering problems remain to be solved. It is believed, however, that their solution is possible if sufficient attention is paid to them in advance. It is hoped that the statement of aims outlined above will perhaps serve as a stimulating medium to get others thinking along the same direction and possibly work out some of the many problems remaining to be solved to help bring those aims about. That all of them will be accomplished at Logan is too much to expect, but if the accomplishment should fall shy of the goal, it will obviously be due to the definite limitations in the way of accomplishment of new things in a single installation and not to any underlying weakness of these aims, nor to their impracticability. In our case, too, it will definitely serve as a stimulus to bring these aims to fruition in the next installation.

Lighting Standards Grounded at Low Cost

[*continued from page 44*]

labor costs per standard averaged $7.15; material costs remained $0.90, making a total of $8.05 per fixture.

Considerable experimenting was done with various methods of attaching the wire to the rod. The most desirable method was to lay the piece of copper wire (No. 6) along the rod about 6 in. from the upper end and braze it in place. This method produced a minimum amount of mass at the place where the wire was attached. Where the wire was wrapped around the rod and brazed it was found that the rod would be driven through the mass and would actually tear the copper loose during the driving operation.

Standard clamp connectors were used where the wire was broken and where it was necessary to extend the ground wire, due to the fact that the rod had to be driven down through a hole in the rock.

Paint & Electricity

THROW NEW LIGHT ON HIDDEN COSTS OF BUSINESS

THE research of the "Better Light — Better Sight" movement has started a lot of new thinking about lighting facilities, and their effect upon production, employee health, labor turnover, accident prevention, etc.

Paint, as a factor in this problem, has received a most intensive study in the laboratories of the Pittsburgh Plate Glass Co. — who are actively co-operating with the "Better Light — Better Sight" campaign. The result is a new line of interior maintenance finishes which bring a *triple benefit:* (1) The most economical conversion of *raw* light into *useful* light. (2) Lower maintenance costs, because of the different finishing systems designed to meet varying exposures. (3) Lower production costs.

These finishes are known as *Glorified Light Products.* They are described and explained fully in the book, "Glorified Light." If you are concerned with production or plant maintenance, your files are not complete today without a copy of this book. Learn how scientific progress in paint manufacture is helping the electrical industry throw new light on hidden costs in business. Mail the coupon below — today.

LISTEN TO *the Music You Love, superbly rendered by the* PITTSBURGH SYMPHONY ORCHESTRA *and distinguished guest artists, every Thursday at 8 P. M. Eastern Standard Time, over N. B. C. Blue Network and associated stations.*

Paint { PITTSBURGH PLATE GLASS COMPANY } *Glass*

PAINT DIVISION • PITTSBURGH, PA.

Makers of Ironhide • Cementhide Waterproofing System • Multi-Namel Glorified Light Products • Gold Stripe Brushes and Maintenance Specialties

3 FINISHING SYSTEMS

The three divisions of *Glorified Light Products,* designed to meet varying plant requirements, are as follows:

THE SNOLITE SYSTEM— a line of superior whites for all normal interior exposures. Flat, Satin, Low Eggshell, Standard Eggshell, Semi-Gloss, Gloss. Tints available in Satin and Semi-Gloss.

THE SNOTEX SYSTEM— for all abnormal interior exposures except where fungus may be expected. The highest attainable resistance to discoloration in the presence of humidity, fumes, gases, heat or unusual absence of daylight.

THE FUNGUSIDE SYSTEM— for use where fungus exists or may be expected. Of especial importance to bakers, brewers, distillers, cheese manufacturers, dairymen, packers and others who must wage a constant battle against bacteria, mold, or other types of fungus.

PITTSBURGH PLATE GLASS CO.
Paint Division, Dept. V-4
Pittsburgh, Pa.

Please send me a copy of your book, "Glorified Light."

*Name*_____

*Address*_____

*City*_____ *State*_____

THE NEW *Reliable* STRAIGHT LINE SPLICE . . .

- Holds wires under tension.
- Holds wires on light twisting pulls.
- Holds used under-sized wires.
- Holds to approximate breaking strength on first use and repeated reuse.
- Made entirely of non-corrosive parts.
- Is easily reclaimed.
- Does not jam or stick when reclaimed.

ORDER SAMPLES AND GET PRICES TODAY

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE • • • • • • • • • CHICAGO, ILLINOIS

26 YEARS SERVICE TO THE UTILITIES

Father and Son

[*Continued from page 39*]

it. They are not the manager's customers nor the president's customers—they are *his* customers, just as the patrons of the country store were Dad's customers. It takes constant attention to maintain such a sense of responsibility. The employee who is granted a measure of authority will make mistakes, but they will be neither numerous nor serious, when he realizes that he cannot pass the buck. Father survived as a business man because he knew conditions and what would happen if he violated them. It is better for the employee to be working in the customer's interest than serving as a stooge for a petty officer.

There is nothing wrong with our service. There is nothing wrong with our charges. When we supply power equal to a strong man working a ten-hour day for a total wage of 2 cents no fair-minded person will accuse us of gouging. The company with a top lighting rate of 4 cents has about the same public relations problems as those found in the company with a top rate of 8 cents.

Nearly all of the trouble is due to a lack of understanding over some relatively simple point which would not have caused the slightest disturbance if time had been taken to make it clear and provided, of course, that the employee involved were thoroughly informed:

Why can't I have three-phase service in my garage?
Why should I pay for service while away on vacation?
Why should I put up a deposit when the magazines are full of ads imploring me to send no money?
Why did he say it wouldn't increase my bill?
Why should I stand in line while your clerks seemingly have nothing to do?
Why can't some one come out Saturday afternoon?
Why can't I see the manager?
Why don't you know how much it will cost to run it?
Why didn't you tell me it would blow a fuse?

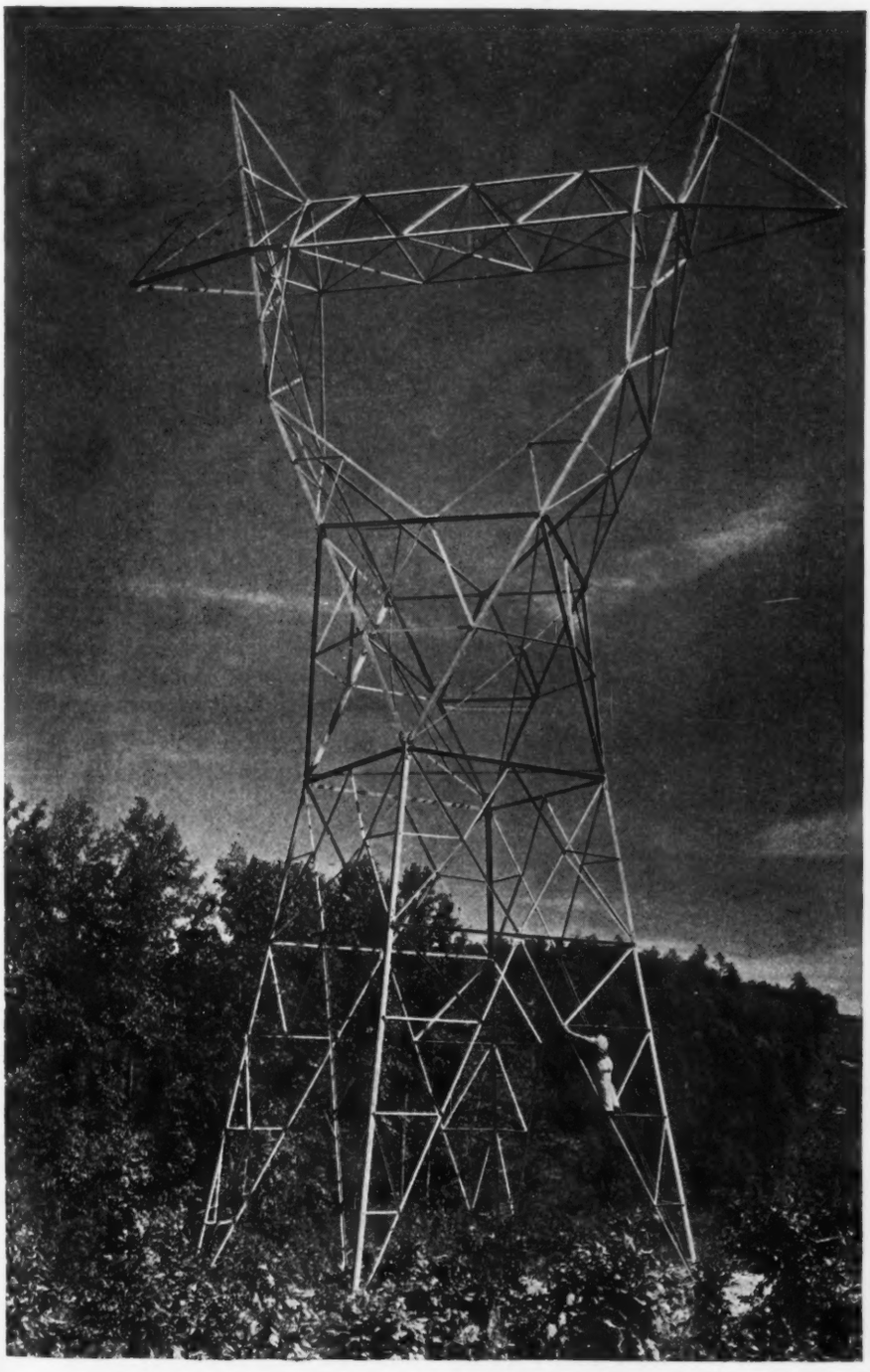
It is not an easy matter, even for one with a diversified experience, to answer all of these questions properly, yet we expect our rank and file, willing and loyal but poorly equipped, to meet such situations and a thousand others in their daily rounds. Father could answer questions about his business and he did.

To those who have had the endurance to read this far three recommen-

TOWERS OF ROTATED TYPE

carry 140 Miles

OF TVA LINE



One of the hundreds of rotated towers carrying the line between Norris Dam and Wilson Dam

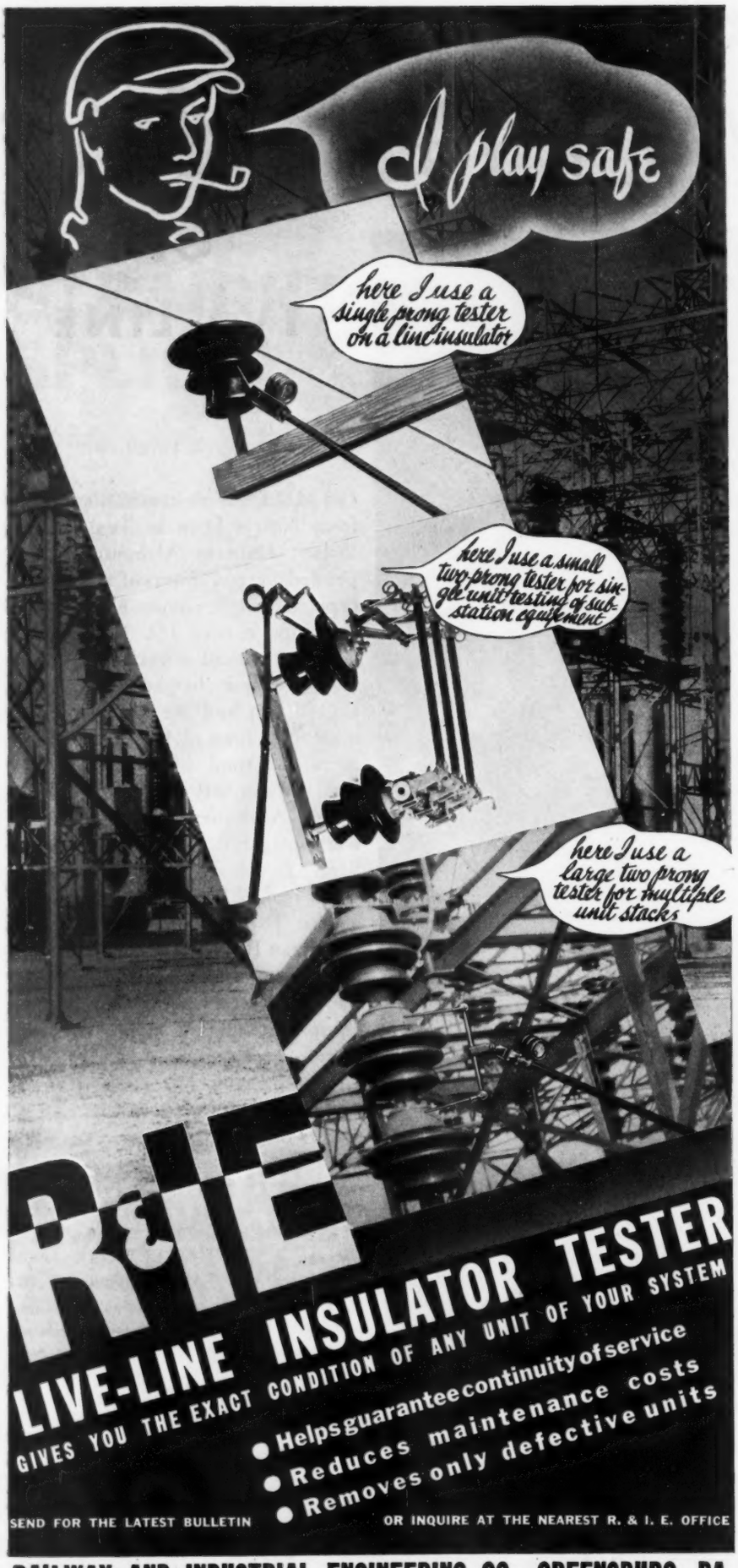
140 MILES of the transmission line from Norris Dam in Tennessee to Wilson Dam in Alabama, is suspended on steel towers of the rotated type. A single circuit high voltage line now carries 154 K V, with 2 lines of ground wires. Suspension towers vary in height from 58 feet to 110 feet and are designed for a maximum span of 1200 feet. They were designed by the American Bridge Company for the Tennessee Valley Authority. Plain materials were furnished by Carnegie-Illinois Steel Corporation and Tennessee Coal, Iron & Railroad Company.

The Tower Department of the American Bridge Company has technical personnel, galvanizing facilities and modern fabricating and erecting equipment for any tower or substation project you may have. In addition, A B C has equipment for "full size" tests of even the largest towers in present day use.

AMERICAN BRIDGE COMPANY, Pittsburgh · CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago · TENNESSEE COAL, IRON & RAILROAD CO., Birmingham, Ala.

Pacific Coast Distributors: Columbia Steel Company, San Francisco · *Export Distributors:* United States Steel Products Co., New York

UNITED STATES STEEL


I play safe
here I use a single prong tester on a line insulator
here I use a small two prong tester for single unit testing of substation equipment
here I use a large two prong tester for multiple unit stacks
R&IE
LIVE-LINE INSULATOR TESTER
GIVES YOU THE EXACT CONDITION OF ANY UNIT OF YOUR SYSTEM
● Helps guarantee continuity of service
● Reduces maintenance costs
● Removes only defective units
SEND FOR THE LATEST BULLETIN
OR INQUIRE AT THE NEAREST R. & I. E. OFFICE
RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

dations are advanced, in the sincere belief that they are meritorious:

1. Public relations should not be a departmental activity in the sense that there is a claim department or a test department to be called into play when needed and at other times ignored. It is a matter of company policy and every one has a part in seeing that a high standard is maintained.
2. An officer of any rank who cannot treat his subordinates as human beings, with everything that that implies, should be isolated, pensioned or otherwise eased out of the organization.
3. Every employee should be steadily supplied with as much information about the company, its methods and policies as his intellectual level will allow him to absorb.

We do not want a military organization, with its opprobrious distinctions between officers and men. In the public service we all are men. In our individual dealings with our customers we all are officers, because the customer is not interested in the intricacies of corporate management. He wants action and he believes that the man with whom he is dealing—salesman, troubleman, meter reader—should be able to handle his case quickly and effectively. And why not? How can we fill the higher positions from the ranks if we neglect training our men while they are in the ranks?

It will be noticed that nothing has been said about educating the public. This paper has not advocated radio programs, motion pictures, lectures, newspaper ads and envelope stuffers proclaiming the high destiny and altruistic motives of this vast industry, for the simple reason that it seems incongruous to shingle the roof before we have laid the foundation.

Nor has anything been said about politics. I feel that it belongs in another category. An organization that goes straight down the line, minding its own business, conducting its affairs with the utmost candor, rigid in principle but flexible in practice, having in mind all the time that it is a servant of the community—such an organization can withstand a surprising amount of politics.

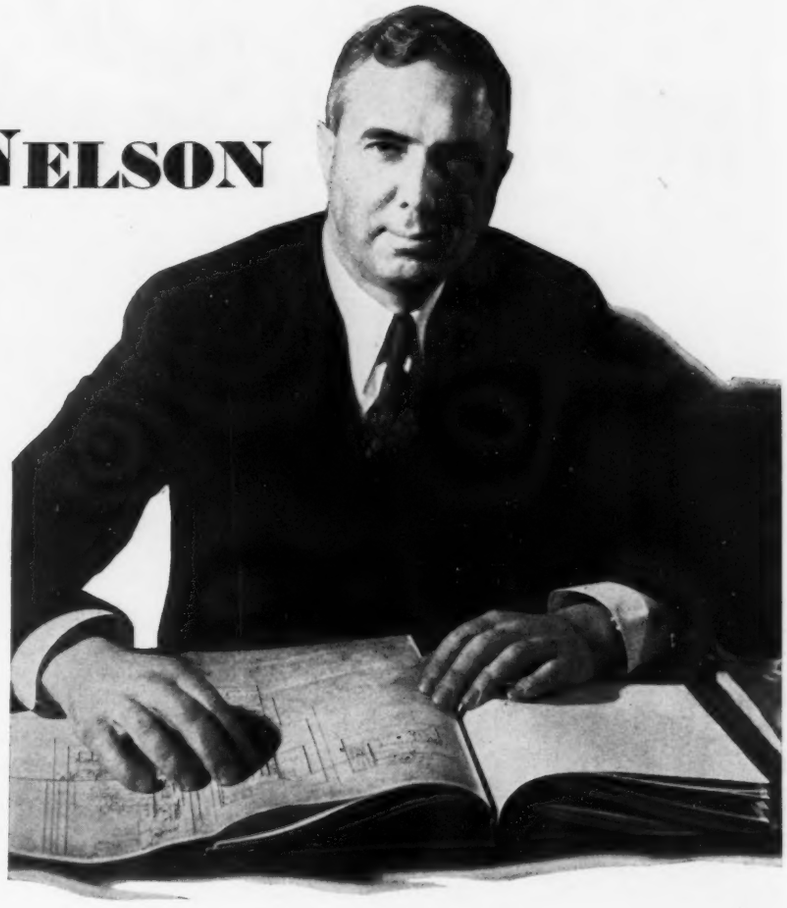
As these last lines are written dusk is closing in, lights are commencing to twinkle, people are going home to supper and in a few hours all will be still. Here Dad would have closed the store for the night. But throughout the darkness our industry is awake—standing guard, patiently unobtrusive, ever alert, resourceful in every crisis. It's a great business and I'm proud to be a part of it. Any one who sees it as I do will not be unfairly critical. It is all a matter of understanding.

Introducing

ARTHUR L. NELSON

Of

Arthur L. Nelson Engineers,
Boston, Mass.



ARTHUR L. NELSON has been in private practice as a consulting engineer for 15 years, and his work embraces a wide range of electrical, mechanical, and economic problems vital to public utilities, industries, and other clients. Construction, operation, and maintenance developments diversify his interests. Here, for instance, is a typical day's work of this busy professional man:

Examined mail relating to active power projects in six states in the area between New England and Gulf of Mexico; disposed of letters from clients, field engineers of the firm, boiler, turbine and equipment manufacturers. . . . Received large package from the Owens Illinois Glass Co. containing latest specimens of glass wool for thermal insulation of boilers and piping.

Telephoned R. A. Smith, chief engineer Holyoke Water Power Company, regarding capacity of service oil tanks, specifications for 900-lb. valves, and approval of safety valve settings and other details of new steam plant. . . . Conferred with M. H. Kuhner, chief mechanical engineer, Boiler Division Riley Stoker Corporation, on superheater outlet for Holyoke boiler.

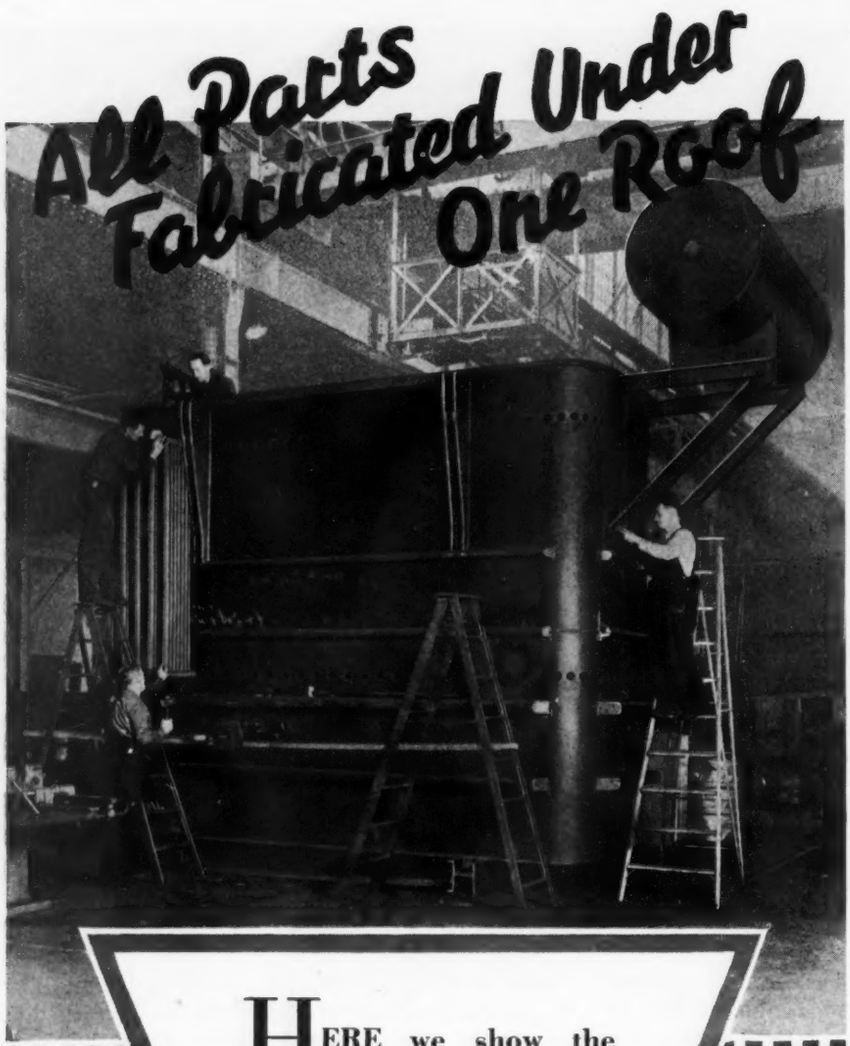
Telephoned Vice-President and General Manager Lufkin of Owens Illinois Glass, Newark, Ohio, re: high-pressure steam plant operation. . . . Dictated letters. . . . Played squash at Union Boat Club with Dr. Leland McKittrick. . . . Lunched at Engineers Club, greeted former Chief Engineer I. E. Moultrop of Boston Edison and chatted with friends and acquaintances.

Conferred with Chester F. Buckley, manager Taunton electric light plant, on condenser auxiliary test. . . . Talked with manufacturers' representatives re: automatic combustion control. . . . Dined at University Club; 'phoned to Houston, Tex., about high-pressure steam plant, Imperial Sugar Company, and took 7:25 train home.

Twenty Years an Electrical World Reader

Throughout Mr. Nelson's professional career, Electrical World has been a reading companion by train and in office, aiding him to keep abreast of progress and broadening his interest in electrical development.

Through its editorial vitality and leadership, Electrical World has become the constant "companion" of thousands of engineers and executives throughout the electrical industry. This represents a tremendous market that can be profitably cultivated through Electrical World. For more complete details, address ELECTRICAL WORLD, 330 WEST 42nd ST., NEW YORK, N. Y.



HERE we show the erection of a tank for a self-cooled 10,000 kva. high-voltage Pennsylvania transformer. We manufacture our own coils, cores, tanks, radiators, tap-changers, cooling coils and other essential transformer parts. Close personal supervision at every step insures uniformly high quality, which results in longer life, greater reliability and lower upkeep.

PENNSYLVANIA TRANSFORMER CO.
1701 Island Ave., N. S., Pittsburgh, Pa.

PENNSYLVANIA TRANSFORMERS

Cable Power Factor Greatly Improved

[*Continued from page 53*]

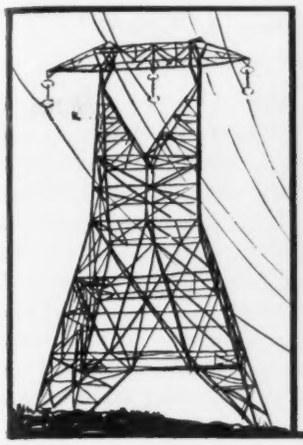
cent power factor change (ionization) and resultant per cent power factor evidenced the beneficial effects of carbon dioxide gas washing treatment.

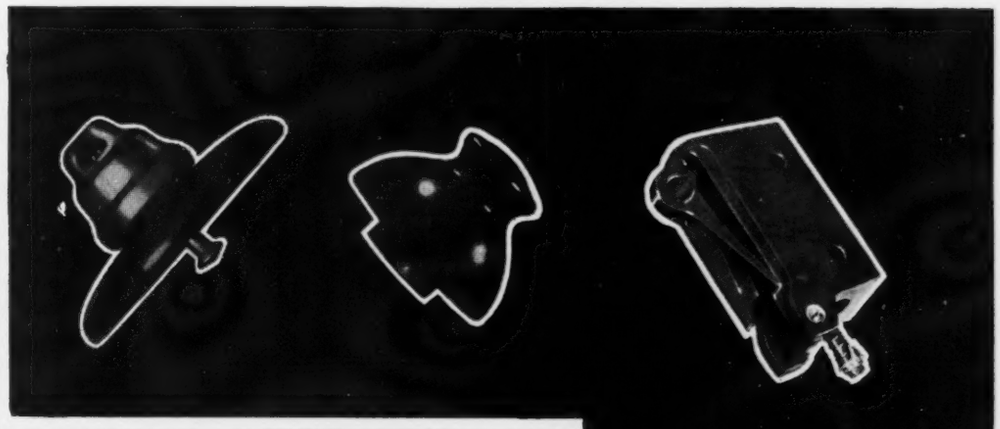
During the past year the question of paper washing has become active again. Apparently its importance is being rediscovered. As a result, we decided to again check our routine washing process and make sure that optimum washing was still being realized. Our regular grades of wood pulp cable paper of both medium density and high density (super-dense) were included in this experiment. Washing of the paper pulp was extended from two to one hundred times normal and samples of the finished paper compared with the regular product.

In some cases sample lots of finished paper instead of pulp were washed for different periods of time for similar comparison. This latter experiment is liable to be misleading, however, if due allowance is not made for physical changes in the finished paper caused by this washing. This is particularly true with highly compressed, super-dense paper. Prolonged soaking in water will permanently swell the paper and decrease the density accordingly. This will result in decreased power factor that might wrongly be attributed to washing out of impurities. Actually, it is due to the fact that the power factor of paper is inherently a function of paper density.

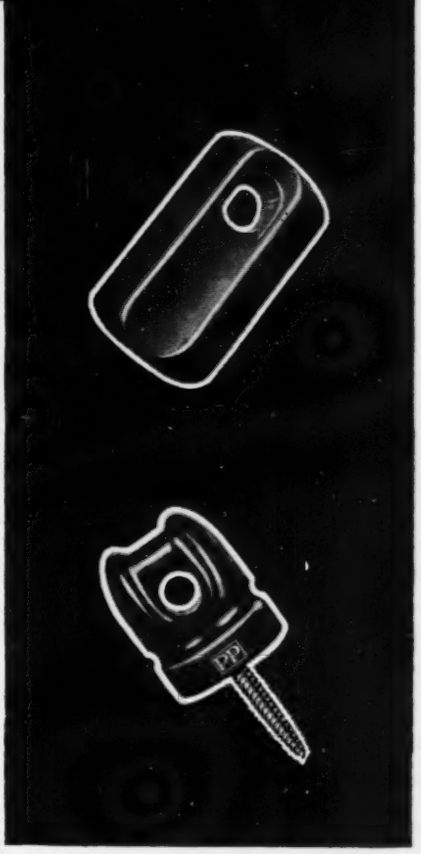
These recent experiments can be summed up by stating that additional washing from two to one hundred times normal caused no noticeable improvement in power factor, thus checking the early work. These experiments were not actually necessary to prove this point. Each batch of cable paper delivered since that time has been tested for power factor. Uniformity of these measurements is a satisfactory control. Impurities in the paper would cause noticeable variations and could be easily detected without resorting to the exaggerated washing.

A typical summary of power factor measurements after different periods of washing paper pulp at the mill are given in the table on page 53. The variations are well within usual limits and show that the standard wash removes all traces of soluble salts and similar impurities.





HI-LINE to HOME



Suspension Insulators	Hi-Line Hardware
Pintypes	Pins
Guy Strains	Clevises
Spools	Racks
Service Wireholders	House Brackets
Entrance Bushings	Dead End Clevises

Primary Cutouts

Insulators and accessory hardware for all your transmission and distribution needs - - complete manufacturing facilities backed by over a quarter of a century of experience.

"Specify Porcelain Products" and Be Sure.

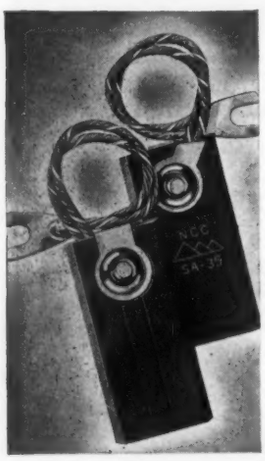
PORCELAIN PRODUCTS INC. Specify PORCELAIN PRODUCTS PP **PARKERSBURG, W. VA. · U. S. A.**

They must be UNIFORM

"Uniform Texture is not Enough"

● Uniform performance is the final measure of brush uniformity. This is achieved in "SA" Series grades.

Intensive research in the National Carbon Company laboratories has disclosed the basic physical properties responsible for satisfactory brush performance. It has also determined the combinations of materials and the methods of manufacture which impart these properties, in uniformly controlled degree, to the brush material.



These are the reasons for the uniform performance experienced by the many users of "SA"Series brushes. These grades possess, in accurate measure, those characteristics which directly contribute to satisfactory and uniform performance on commutating equipment.

●

An "SA" Series grade is not "just another brush." It is an engineering achievement.

PROVE THIS YOURSELF BY A TRIAL

NATIONAL CARBON COMPANY, INC.
Carbon Sales Division, Cleveland, Ohio
Unit of Union Carbide UCC and Carbon Corporation
Branch Sales Offices: New York Pittsburgh Chicago San Francisco

She Became a "Grunt"

[*Continued from page 54*]

volt wire burned in two and the hot end lying close to the highway, with the current on. The wire was invisible, but every few minutes you could see a blaze of fire, where the wire was grounded, coming from the snow. Several people had gathered to watch the blaze and listen to it singing. It was really quite a sight. As luck would have it, we were equipped with a pair of rubber gloves. Mr. Boyd ordered the people back and cut the wire.

On to the next. The telephone man had cut the service that was feeding two houses. Both of these wires had to be spliced about a foot, due to the fact that the telephone man did not undo the tap from the line, but cut the wire out from the pole. However, the service to these houses was not near the telephone lines.

At the next place we didn't have a ladder long enough to reach where the service fastened to the house. We went through the house to the second floor and out on a little porch to repair this service. Now Mr. Smith could have hot water to wash his face.

Current restored to eighteen places, meaning eighteen poor souls made happy. And they were really happy. Nine o'clock and a call that the southwest part of Worth was without service. The telephone service had just been restored between Grant City and Worth. We decided to eat a sandwich and get warm before starting on to Worth. A few minutes later Briggs and Norman arrived in town and proceeded to take care of the rest of the trouble.

It was a most interesting experience and I sincerely hope I get the opportunity again to be classed as a "Grunt."

●

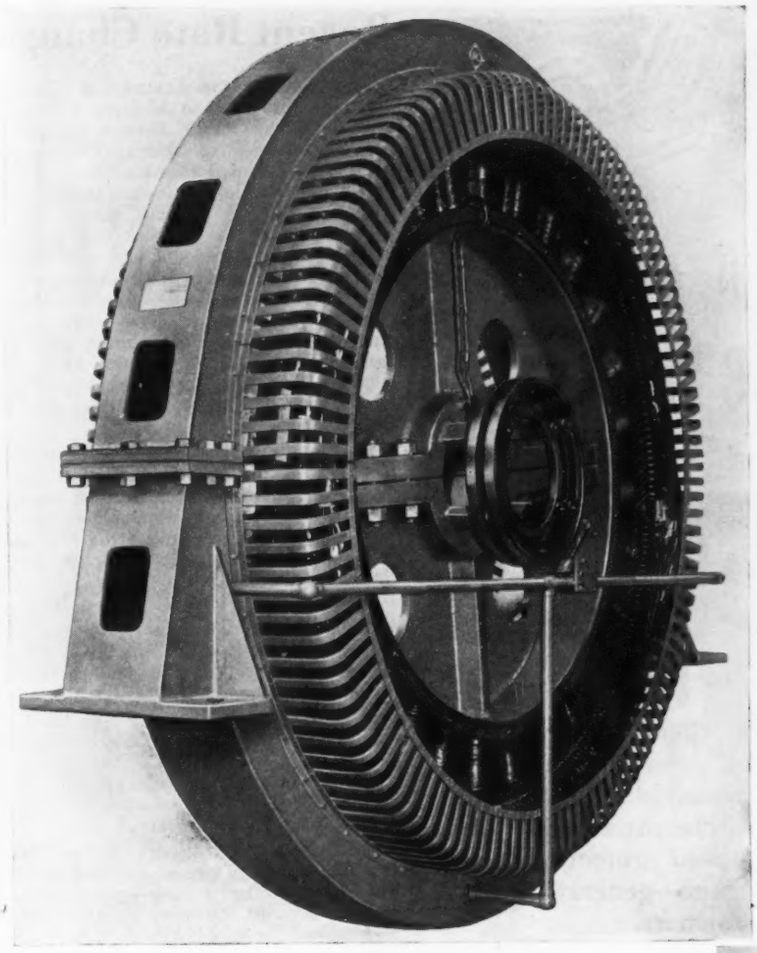
14.6 Per Cent for Taxes

Out of every dollar received from gas and electric customers in 1935, the Niagara Hudson System paid 14.6 cents in state and local taxes, a total of $11,033,308.15, the company announces.

●

Construction Postponed

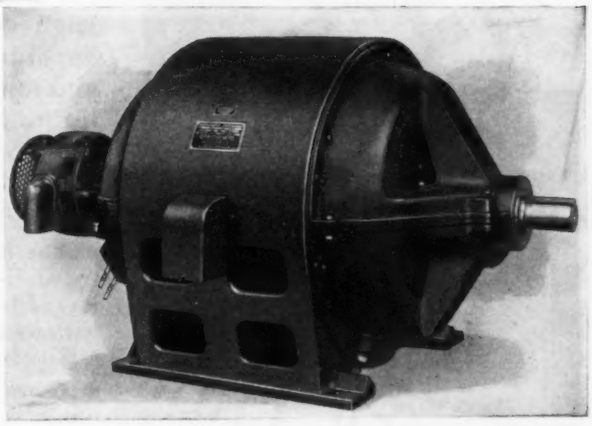
Construction of West Kootenay Power & Light's proposed $12,000,000 hydroelectric plant at the mouth of the Pend Oreille River, below Trail, B. C., has again been postponed. Earlier this year the company had planned to start work this spring.



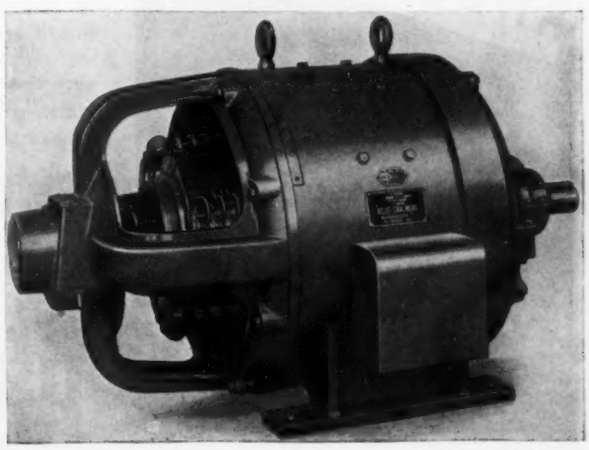
To Meet Your Generator Requirements

● Whatever your requirements for generators are ... a-c or d-c, large or small, standard machines or special ... Allis-Chalmers can meet them. The experience of Allis-Chalmers in building generators of every type, for steam and internal combustion engine drive, in all sizes, extends over a period of more than forty years. Continued electrical and mechanical improvement, together with constant testing and experimentation have brought the design and workmanship of Allis-Chalmers generators to a high degree of perfection.

● Allis-Chalmers also builds exciters, switchboards, instrument and metering transformers, generator voltage regulators (rocking contact type), metal-clad switchgear, pumps for water supply, and motors of all types for the Diesel power plant. Power and distribution transformers and automatic feeder voltage regulators are built for the distribution system.



Above—Bracket Bearing A-C Generator
Below—Bracket Bearing D-C Generator



ALLIS-CHALMERS
Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A.

● Another barrier to increased system stability is now removed. The new HA ratio-differential relay links *high-speed* protection to a-c. apparatus—generators and transformers.

High-speed protection of a-c. apparatus reduces damage, and makes possible the maximum benefits of high-speed line protection.

OUTSTANDING ADVANTAGES

● The HA is the first high-speed transformer relay that disregards magnetizing current inrush without sacrificing any operating characteristics.

● It has an extremely low burden which is very important in connection with low-capacity current transformers.

● The HA requires little switchboard space. It is a three-phase, self-contained unit. The generator type is only 5½ inches square—the transformer type just 5½ inches by 12 inches.

For complete information about the HA, just ask for C.S. 41-405.

J40006

Westinghouse

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Recent Rate Changes

NEW YORK STATE ELECTRIC & GAS CORPORATION has filed a revision of electric rates with the Public Service Commission for the villages of Alden, Depew, East Aurora, Hamburg, Lancaster, Orchard Park, Sloan, East Randolph, Gowanda, Perrysburg, Randolph, South Dayton, Cherry Creek, Forestville and Silver Creek and surrounding territory which would save customers an estimated $117,100 annually. A single block rate for residential use is to replace the two optional rates—one a block form and the other based on a fixed charge plus floor areas. The new rate amounts to a minimum of $1 for the first 11 kw.-hr., 4½ cents for the next 32, 3 cents for the next 67 and 2 cents thereafter.

ALABAMA POWER COMPANY estimates that the new rates which went into effect April 1 will save 20,000 customers $60,000 annually. All urban customers were placed on the "immediate" A-4 rate and given the opportunity to qualify for the lower "objective" rate.

OHIO PUBLIC UTILITIES COMMISSION has granted rural customers a 1 per cent reduction in the minimum monthly charge which in 1930 was set at 2 per cent per month for four years on such lines.

SEATTLE CITY LIGHT, seeking to add to the commercial cooking, baking, heating and refrigeration load, has asked the City Council to reduce such rates 20 per cent which would afford some 250 establishments a saving of about $3,500 a year.

SOUTHEASTERN NEBRASKA PUBLIC POWER DISTRICT announces rural rates of $3.75 for the first 40 kw.-hr., 4 cents per kilowatt-hour for the next 40, 2½ cents for the next 120 and 2 cents for all additional.

SOUTHERN OHIO ELECTRIC COMPANY has offered to cut street lighting rates in Chillicothe, Ohio, as well as to reduce residential rates.

TWIN STATES GAS & ELECTRIC COMPANY has offered to reduce rates $2,200 annually in Hoosick and Hoosick Falls, N. Y. The Public Service Commission allowed the rates to become effective April 1 without approval or disapproval.

NEW YORK POWER & LIGHT CORPORATION has filed revised rate schedules estimated to reduce bills $38,600 annually in the Broadalbin, St. Johnsville, Canajoharie, Port Henry and Gloversville districts. The minimum residential rate would be 75 cents a month at 7½ cents for the first 10 kw.-hr., 5½ cents for the next 45, 3 cents for the next 145 and 1½ cents for all additional.

ARKANSAS POWER & LIGHT COMPANY has filed an appeal with the State Department of Utilities from the town of Batesville's ordinance ordering a reduction in rates. The company contends the rates are confiscatory.

MONTANA-DAKOTA POWER COMPANY has filed with the North Dakota Board of Railroad Commissioners proposed reductions in commercial and residential electric rates in approximately 60 communities to affect an estimated $75,000 in consumer savings annually. The cut will bring the minimum monthly bill down to $1 from $1.25. With a base rate of $1 the first 50 kw.-hr. per month cost would be reduced from 6 cents to 5½ cents, while the remaining step rate would be the same—3¾ cents per kilowatt-hour per month for the next 150 kw.-hr. and two cents for all in excess of that amount monthly. A half-cent cut in the commercial rate for the first 100 kw.-hr. per month also is proposed. The rate would be cut from 10 cents to 9½ cents for the first 100 kw.hr. per month. Steps of 9 cents for the

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By May 15th, 35 power companies from coast to coast will distribute copies of Timely Ideas to their industrial power users. Timely Ideas is a publication which seeks out new ideas on power use from everywhere in the country; presents these ideas interestingly and briefly accompanied by many photographs. Timely Ideas covers the range of industrial electrical uses.

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next 100 kw.-hr.; 5 cents for the next 300 kw.-hr. and 4 cents for all in excess of 500 kw.-hr. per month still remain in force.

OHIO PUBLIC UTILITIES COMMISSION has issued an order, effective with the May 1 billing, reducing to 1 per cent from 2 per cent the guaranteed monthly minimum charges for all electric companies in rural sections. Initial minimum guarantee of 2 per cent was established in 1930 for a four-year period and rural groups asked a revision downward. Utilities Chairman E. J. Hopple said the order would "contribute much to development of rural electrification."

•

Municipal Plants

CHATTANOOGA, TENN.—The city power board has decided to sell $100,000 of bonds and complete plans for its $8,000,000 municipal power plant on the assumption that these steps will increase the chance of favorable P.W.A. action on the loan request. Difficulties began to crop up immediately, however, with Mayor Ed Bass proposing to sell power plant bonds rather than general obligations and running into opposition of Power Board Chairman Harold C. Fiske. Colonel Fiske contends that the plant will have to compete with Tennessee Electric Power and that investors, therefore, may not welcome bonds secured only by the municipal plant. The Mayor opposed general obligations on the grounds that the city's debt is already $14,000,000 and he doesn't want to strain local credit.

MARIETTA, OHIO—The Marietta Electrical Company played Good Samaritan to its customers in the flood area recently by supplying current free of charge. More than 300 families benefited.

YARMOUTH, NOVA SCOTIA—Agitation is rising in the city for repurchase of the municipal electric plant sold for $3,000 some years ago to the Nova Scotia Light & Power Company. Citizens charge that rates have become ruinous to local industry and that many companies have installed their own power plants as a result. J. B. Hayes, president of the private company, was here recently to talk over rates with the Council and members of the local Board of Trade.

PARAGOULD, ARK.—Local officials have canceled their plans for the sale of $190,000 power and light plant bonds pending the outcome of the suit for an injunction against the municipal project filed in the District of Columbia Supreme Court.

VANCOUVER, B. C.—The mystery surrounding the backers of the municipal ownership campaign here threatens to come out into the open. For some six months there have been periodic discussions in the City Council, mentioning various nebulous schemes but steering clear of the sponsors. Now the story is that the group would sell bonds to build local plant or to buy facilities of the British Columbia Electric Railway Company, pledging only the properties, liquidating the debt out of revenues and turning the plant over to the city scotfree in 25 years. The sponsors are said to be a group which has been successful with that sort of thing in the United States.

AYR, NEB.—Local officials and the Southern Nebraska Power Company have announced that they will appeal to the state Supreme Court from the District Court decision invalidating sale of the village's power system to the utility company. The sale was disallowed as violating the state law requiring a vote of the residents for such a transaction and limiting the expenditure incident to the election to $1 per voter.

State authorities contend too much money was spent.

ISLIP, N. Y.—The loan and grant of $75,000 from the P.W.A. for a generating plant has been increased to $95,000.

SEWARD, ALASKA—The P.W.A. loan and grant of $118,000 for a municipal electric plant has been increased to $166,000 to allow for an increase in the scope of the project.

ROCK RAPIDS, IOWA—Issuance of $100,000 electric light and power plant bonds recently was approved by a vote of 541 to 21.

VINTON, IOWA—An ordinance authorizing $30,000 of municipal light and power plant bonds has been approved by the City Council.

FALL RIVER, WIS.—Action of the Wisconsin Public Service Commission setting a purchase price of $9,500 on the plant of the Wisconsin Power & Light Company has been appealed to the state supreme court. Other previous orders of the commission setting a price of $13,500 on the McFarland plant of Wisconsin Power & Light and authorizing the village of Hustisford to set up a competing municipal utility with the Hustisford Power, Light & Manufacturing Company have also been appealed to the supreme court.

LINCOLN COUNTY, WIS.—State Public Service Commission has held the proposed Lincoln County municipal power district feasible. The proposed district, second planned under the 1931 power district law, would include all of Lincoln County.

PARDEEVILLE, WIS.—State Public Service Commission has been confronted with a demand that its decision on municipal acquisition of the Pardeeville Electric Light Company plant be given by a full body of three members. The commission has been operating with two members for nearly two years since the death of Chairman Theodore Kronshage. Demand for a ruling by a full commission was made by David Bogue, Portage attorney for the Pardeeville utility, whose plant the village voted to acquire about two years ago. Testimony has been concluded on which the commission will determine a purchase price for the plant. The supreme court has ruled that the utility is not entitled to jury trial of its unwillingness to sell.

•

Par Value Cut Planned

Reduction of the common stock's par value to $21 from $25 and transfer of the $380,624 balance to surplus will be considered by Southwestern Light & Power at the annual meeting April 21.

•

Dissolutions Approved

Dissolution of two Pacific Gas & Electric subsidiaries—Great Western Power of California and its affiliate, California Electric Generating—has been approved by the units' preferred-stock holders, who will receive par for their stocks.

•

Would Double Hydro Tax

A bill in the South Carolina Legislature would raise the tax on hydro-electric power to 1 cent per kilowatt-hour from the present half-cent rate.

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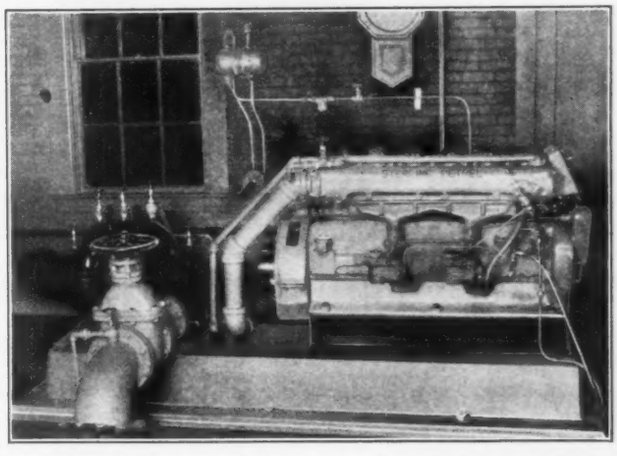

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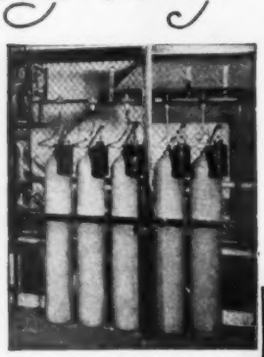

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LUX was the first *automatic* fire protection ever devised or successfully installed for the protection of electrical equipment—yet its cost is lower than you think, being less than ½ of 1% of the cost of equipment it protects.

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SALES OPPORTUNITIES IN NEW CONSTRUCTION

PARK CITY, UTAH—Utah Power & Light Company, Salt Lake City, Utah, has authorized surveys for new 44,000-volt transmission line from point near Provo, Utah, to Park City, about 25 miles, and will begin construction soon. Work will be carried out in connection with new steam-electric generating station on site about 4 miles from Provo, recently referred to in these columns, on which construction is scheduled to begin this spring. Other transmission lines will be built later, as well as power substations and switching stations. Entire project will cost close to $1,500,000.

EDWARDSPORT, IND.—Public Service Company of Indiana, Indianapolis, plans early rebuilding of control station at power plant at Edwardsport, recently damaged by fire. Loss about $50,000.

HOUSTON, TEX.—Continental Can Company, New York, N. Y., plans installation of motors and controls, conveyors and other equipment in new addition to plant at Houston. Cost close to $250,000.

DE LAND, FLA.—Has authorized financing in amount of $468,000 for new city-owned electric power plant and distributing system, including power substation and service facilities. A portion of fund will be secured through federal grant.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, Washington, receives bids until April 22 for 12,000 feet insulated electric cable, 4,000 feet five-conductor cable, 3,000 feet telephone cable, quantity of insulators, insulator pins, magnet wire, magnetic switches, plug-type switches, panelboards, electric lighting fixtures and other electrical supplies (Schedule 3137).

LOS ANGELES, CALIF.—Metropolitan Water District, 306 West Third Street, F. E. Weymouth, chief engineer and general manager, receives bids until April 23 for quantity of synchronous motors for station service (Specifications 153).

AUSTIN, IND.—Morgan Packing Company plans installation of motors and controls, conveyors and other equipment in new addition to meat products packing plant. Cost close to $100,000.

COLUMBUS, NEB.—Loup River Public Power District, Columbus, C. B. Fricke, president, receives bids until April 21 for outdoor power substation equipment for Monroe power plant, including oil circuit breakers, transformers, disconnecting switches, lightning arresters, steel supporting structures, bus supports and pedestals, etc., as covered by five schedules. Harza Engineering Company, 20 North Wacker Drive, Chicago, Ill., is consulting engineer.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, Knoxville, receives bids until April 17 for ventilating system for Wheeler hydroelectric power plant.

LEHIGH, N. D.—Lehigh Briquetting Company plans installation of steam turbo-generating unit, about 750 kw. rating, and auxiliary equipment, coal-handling equipment, motors and controls, conveyors and other equipment for expansion and improvements in fuel briquet plant. Cost over $300,000. Walter H. Wheeler, Metropolitan Life Building, Minneapolis, Minn., is consulting engineer; K. A. Loven, 1506 Seventh Street, North, Fargo, N. D., is company engineer.

ROSSVILLE, GA.—Peerless Woolen Mills plan installation of motors and controls, transformers and accessories, conveyors and other equipment in new additions to mill. Cost close to $300,000. Robert & Company,

Bona Allen Building, Atlanta, Ga., are engineers.

BUFFALO, N. Y.—New York State Electric & Gas Corporation has authorized rural electrification project in 1936 in twelve operating districts in parts of Erie, Wyoming, Niagara, Chautauqua, Broome, Cortland, Tioga and other counties, totaling about 665 miles of transmission and distributing lines, with power substation and service facilities. Cost about $1,300,000. Permission has been secured to arrange bond issue of $1,000,000, proceeds to be used exclusively for purpose noted.

PITTSBURGH, PA. — Edgewater Steel Company, Oakmont, Pittsburgh, plans installation of motors and controls, conveyors, electric hoists and other equipment in new addition to steel wheel and tire mill. Cost close to $100,000.

ABERDEEN, WASH. — West Coast Plywood Company plans power plant in connection with new local mill. Will install motors and controls, conveyors, electric hoists, etc., for mill service. Entire project will cost about $175,000.

TEMPLE, TEX.—Belfalls Light & Power Company, Temple, care of William G. Morrison, Bartlett, Tex., engineer in charge, plans Diesel engine-generating plant in vicinity of Bartlett, in connection with transmission and distributing lines for rural electrification project, recently noted in these columns. Cost $450,000. Financing is being arranged through federal aid.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, Washington, receives bids until April 17 for quantity of insulated electric cable for Eastern and Western Navy Yards (Schedule 7546).

SUMNER, IOWA — City and Bremer County Commissioners plan transmission and distributing lines for rural electrification in portion of Bremer and Fayette Counties, totaling about 79 miles, with power substation and service facilities. Cost about $100,000. Financing has been arranged through federal aid in amount of $79,300, and work scheduled to begin this spring.

DELTA, COLO.—Is completing plans for new city-owned electric power plant, using Diesel engine-generator units, and plans to ask bids soon. Cost about $200,000. Financing has been arranged. Wood & Weber, 1035 Pearl Street, Denver, Colo., are consulting engineers.

LOS ANGELES, CALIF.—Is arranging appropriation of $491,000 for installation of fire alarm and police signal systems in metropolitan area, and San Fernando Valley, Venice and San Pedro-Wilmington districts in 1936-37, including complete automatic equipment.

WILMINGTON, N. C.—Tidewater Power Company has authorized transmission line in Pender County, for rural electrification in Penderlea district, where distributing lines and service facilities will be installed.

HINSDALE, N. H. — Hinsdale Paper Manufacturing Company plans installation of motors and controls, regulators, conveyors and other equipment in connection with rebuilding of tissue paper mill destroyed by fire a number of weeks ago. General erection contract will be let soon. Cost over $100,000. McClintock & Craig, 458 Bridge Street, Springfield, Mass., are consulting engineers.

NEVADA, MO.—State Building Commission, Capitol Building, Jefferson City, Mo., Edgar M. Eagan, executive secretary, will soon take bids on revised plans for extensions and improvements in power plant at institution at Nevada, with installation of new equipment. Bids recently received have been rejected. Cost about $190,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

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Two Systems' Output Gains
Highest Month
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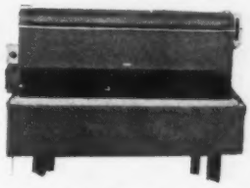

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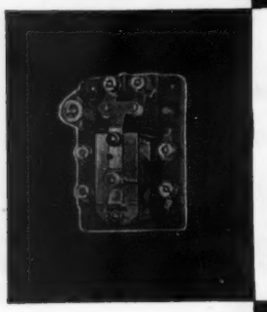

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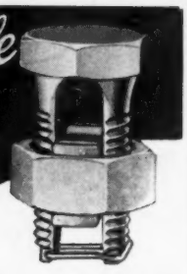

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Kelvinator Corp., Detroit, Mich.
Westinghouse E. & M. Co., E. Pittsburgh, Pa.

ALLOYS, COPPER
Mallory & Co., P. R., Indianapolis, Ind.

AMMETER, CLIP-ON
Columbia Elec. Mfg. Co., Cleveland, Ohio
Ferranti Electric, Inc., New York, N. Y.

ANALYSES, REVENUE
Recording & Statistical Corp., New York, N. Y.

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Chance Company, Centralia, Mo.
Everstick Anchor Co., Fairfield, Iowa.
Hubbard & Co., Pittsburgh, Pa.
Kearney Corp., James R., St. Louis, Mo.
Line Material Co., South Milwaukee, Wis.

ANNUNCIATORS
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National Carbon Co., Cleveland, Ohio

BURNERS, OIL, GAS, PULVERIZED FUEL
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.

BUS BAR SUPPORTS
Burndy Engineering Co., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Schweitzer & Conrad, Inc., Chicago, Ill.

BUS BARS & TUBES
American Brass Co., Waterbury, Conn.

CABLE, ALUMINUM
Aluminum Co. of America, Pittsburgh, Pa.
General Cable Corp., New York, N. Y.

CABLE, NETWORK
Anaconda Wire & Cable Co., New York, N. Y.
American Steel & Wire Co., Chicago, Ill.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
Rockbestos Products Corp., New Haven, Conn.

CABLE, PAPER INSULATED
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kennecott Wire & Cable Co., Phillipsdale, R. I.
Okonite-Callender Cable Co., Passaic, N. J.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

CABLE, PARKWAY
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
Kerite Ins. Wire & Cable Co., New York, N. Y.
Okonite Co., Passaic, N. J.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

OSHKOSH

POLE LINE CONSTRUCTION TOOLS
WARNING SIGNS

Ladders	Digging Bars
Peavies	Shovels and Spoons
Cant Hooks	Pike Poles
Lug Hooks	Extra Handles
Pole Supports	Reels
Tree Trimmers and Saws	Diggers
Tamping Bars	Barricades

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